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CHEMICAL WEEKLY

VOL. XXXVII MAY 5, 1992 NO. 35

The Chemical Plant Industry and the Computer Revolution

THE design of process plant has followed a series of evolutionary steps over the past 60 years. In recent times, the computer has speeded up calculations, firstly of stress levels in components and later of flow rates, process changes and material counting.

The drive was to reduce the manpower needed, and thus reduce costs. But the actual result was to provide a tool for increasingly complex plant design with greater precision and safety than before.

The ability to perform huge and complex calculations in a reasonable time created the pressure to do so. Manhours were not reduced, but the quality of the final design enhanced instead. This pressure was compounded by the ever-increasing necessity to provide mathematical validation of the safety and efficiency of a proposed design for the plant owner and the increasing number of regulatory authorities becoming involved in the design process.

By 1982 a new capability had emerged in the field of engineering, namely Computer Aided Design (CAD), initially more accurately called computer-aided drafting. By 1985, it had become possible to generate three-dimensional computer models of real plant prior to construction.

Use of computer-aided design in the chemical industry has enabled great strides to be taken in recent years in terms of design accuracy and reduced design time for chemical plant. Chemical contractors, and companies that perform their own plant engineering in-house, have reaped the rewards of better project definition and management, fewer design faults reaching the construction stage, and more on-schedule start-ups.

One of the most visible advances has been the ability to generate on-screen 3D models of the plant during the design stage. These allow the design team to visualise the plant at an early stage, and to ensure that the design is physically correct, with no clashes of piping and process equipment with other parts of the plant such as steel support work, the heating and ventilation system and cable trays. It has been estimated that avoidance of on-site reworking to correct design mistakes can save some 2-5% of overall costs.

Computer modelling also allows the client to be kept up to date during the design process, and eliminates the production of a costly, and inflexible, physical scale model of the final design for customer-contractor review.

The latest versions of these powerful 3D visualisation software packages incorporate a 'walk through' capability whereby the viewer can be moved through the computer model of the design, so that he can see what the plant will look like from any internal viewpoint. This capability enables engineering companies and plant operators to carry out design model reviews and perform logistical studies for construction, operator training and plant maintenance.

At first efforts to use 3D CAD for chemical plant attempted to reproduce the earlier well tried methods of working with plastic models. However it rapidly became apparent that more benefit could be gained by modification to traditional working practices to take better advantage of computer power.

The first lesson came from the application of total quality management, leading to the realisation that it was best to ensure that all data entered into the computer model are entered just once and by the appropriate authority responsible for the data. Data are then readily available for all other participants in the design team, and are not mis-copied or forgotten. The second lesson is to exploit the ability of the computer model to assist

in the coordination of the design as it progresses. This is achieved by having a large number of available reference files to a given design. Using this feature, a piping designer, for instance, can work in his design file in the computer which is effectively his 3D model world. In the Intergraph Plant Design System (PDS) used by Foster Wheeler, 32 such reference files are available in each design file, allowing a vast field of information access to the designer through his design 'window'.

But, to take advantage of this potential, strong project management is required to ensure that maximum advantage is taken of the design possibility. It must also be remembered that the 3D computer graphics model created is backed by a large database, which can also be exploited by the project management team. For instance, a large array of reports can be generated from it to assist control of the project initially and the construction of the plant finally.

This information can potentially be used in many downstream engineering areas, such as during plant erection, commissioning and testing, and afterwards for plant maintenance, modifications and revamps. John Sanins, product manager in the process plant division of Cambridge, UK-based Cadcentre, believes that in future more plant owners and operators will invest in such computer based modelling systems so that they can accept the records of the plant in computer form, and keep them up to date, giving an accurate as-built description of the plant they are operating.

Sanins sees the benefit to the plant operator extending even further over the next two years or so, thanks to developments in 'open systems' compatibility. The computer industry as a whole has been developing standards so that software packages from different suppliers can be linked together to form integrated systems running on their own hardware.

In the chemical engineering/CAD fields this will enable the design database for a plant to communicate with other databases and software programmes. For instance, Cadcentre is looking at the possibility of using its *Review* 3D plant visualisation system as a way to access other data-bases of plant information. These might include computer-held maintenance schedules and records, stock control and ordering software and even traceability details of who conducted work on the plant during construction, to what standards, and when.

Using *Review*, the plant operator could identify on-screen, the component he is interested in, say a pump or valve. The *Review* system leads back to the plant design database which contains a complete identific tion and description of the item. By linking this with t maintenance software and database, the operator cou automatically be presented with the maintenance h tory of the part he has pinpointed on the *Review* d play, and when it next needs servicing. The san procedure could be implemented for ordering replac ment parts, or calling up on-line documentation on pla components.

Another advantage to the plant operator of having on-site computer design capability is that it gives hi the ability to keep a complete, and up to date, reco of the plant as-built. Not as it was originally designe but as it is at the present time.

And, if at any time the plant is scheduled for a maj modification or rewamp involving an outside contracto the computerised plant description can be returned the contractor, eliminating much error and work in rea sessing the current status of the plant. The compute plant model can also be used by the plant owner hazard and operability (hazop) type studies, to asses the effects of any modifications on the plant.

The early software available to the petrochemic industry in this field was effective in the modelling piping, structures and equipment only. It is, howeve obvious that if the technique is effective in these area it must be so in others. The PDS software comprise a large suit of interlocking programmes which, althoug intended to address a particular design discipline suc as piping or structural steel, are also designed to inte face with the software for other disciplines in the PD system.

Foster Wheeler has thus been able to develop a integrated approach to the design of process plant b using this software to produce 'intelligent", i.e. database linked, process flow diagrams, process and instrumen tation diagrams (PIDs), piping models, etc. — indeed all the facets that go to make up the complete desig of the modern process plant.

New links to analysis software from PDS for pipe stress, finite element analysis, flow calculations an even process simulation packages allow a constan refinement to working practices to continue. This als continues the evolutionary path in design method whic experience has shown leads to the design and constru tion of even-better quality plant, at the right price.

Cadcentre already offers a front-end engineerin package PEGS (project engineering graphics system

hat is integrated with its PDMS (plant design management system) software for detailed engineering and plant modelling. Data from PEGS, used to compile schematic 2D drawings of pipework and instrumentation, can be passed straight into PDMS for detailed engineering and 3D modelling to take place.

Full integration would allow the designer to link other packages, from other suppliers, into the system. These could include pipe stress analysis packages, process simulation packages, and the like. Such a possibility has been talked about for a number of years, but recently the work to make it possible has been accelerating.

The next 2-3 years should see the possibility of assembling a fully integrated design system come to fruition. Some components are available now, he says and others are close. However, the overall quality of the system will still have to be judged on its own merits.

If integration of software products is the leading development today, a close second must be the dramatic increase in speed and power of the hardware available on which to run the programmes. The late 1980s saw a shift in emphasis away from mini- or mainframe computers to powerful, high-speed workstations with their own processing power.

These have brought the advantage of a lowering in cost/seat to the user, and given greater flexibility in the configuration of systems in the large contracting engineering operations. Such lowering of costs will make it more attractive for plant operators to make the leap to using computers to keep plant design records.

— **T.P.S. RAJAN**

(Source: *ECN*, 16.12.91)

CHEMARENA

S.L. VENKITESWARAN

Global Environment

The "Earth Day" has gone and the drought and near-famine conditions persist in parts of Africa. Talks on greenhouse gases limitation have led nowhere and acute differences between the developed and developing areas will bog down the "Earth Summit" in June in Rio de Janeiro, Brazil. But the Worldwatch Institute of USA continues its advocacy of a global environmental revolution towards a "sustainable development". According to their experts the inhabitants of the world are at a crucial crossroad. The last half century has seen "progress" at an unimaginable scale with the acute differences of development between the areas. Unless the world economy shifts to an environmentally sustainable path there may be disaster ahead next century. The call for any rethinking of our basic values and vision of progress finds little response from the West or steps towards energy security for the coming century. "There is an inexorable link between ecological ills and trade, debt, inequality and consumption". The "ecological debt" rises faster than the financial debts.

The environmental problems are global in scope and require international agreements to ensure that the levels of emmissions of carbon dioxide worldwide have to be kept under control. The UN may have to be a forum for strengthening global environmental governance and take a totally new orientation when it completes 50 years of efforts towards international peace. "What is needed is a transfer of financial and technological support from north to south — from wealthy developed countries to debt ridden trade-starved developing countries". There is need for major changes in the way and the level of production of goods and use of energy and the way the goods are used and disposed of. This may be a cry in the wilderness for the awareness of global consequences of inaction has not penetrated to the common man.

Intellectual Property Rights

The Damocles sword of Ms Carla Hills, the commerce authority of USA is hanging over India's head to compel or persuade India to sign up on TRIPS and the Geneva Protocol even when many countries are against such stiff terms on Patent rights. Our own efforts on globalisation may indirectly force India to succumb with serious consequences for the future in her chemical, pharmaceutical and agrochemical industries.

There are moves by USA to get China to agree on "upgrading" its patent, copyright and trade secret laws to bring them in line with "international norms" and for effective enforcement of such revised laws. The US Pharmaceutical Manufacturers Association estimates that US producers are losing between $ 245 to $ 305 million a year from piracy of patented US drugs in China. Similar is the case on pesticides with products like "Roundup", "Lasso" and "Mechete" being produced in violation of Patent rights. Overall, US exported $ 1.8 billion of chemicals to China and imported only $ 410 million in 1990 — chiefly fertilisers. Organic chemicals, plastics were the exports to the evident relief of US producers. US imported from China inorganic chemicals, organic chemicals and some pharmaceuticals (traditional items long after patents cover).

Bilateral Agreements are being negotiated with China and likely to include: (1) China's acceptance of Berne Copyright convention; (2) Geneva Phonograms convention; (3) Treatment of computer software as literary works and of course (4) full patent protection for US pharmaceutical and agro chemicals from 1993 providing market exclusivity for products patented between 1986 and 1993, not marketed in China, along with 20 year life for the rights. There will be a ban on compulsory licensing for production in China. One hopes that this does not set a precedence for US dictates on India on TRIPS.

An analysis of the countries which are the wrost risks in protection of intellectual property rights by an US study show, India, Indonesia, Thailand, Brazil and Nigeria in that order. The best protectors are Hongkong, Spain, Singapore. The study is by a University of Pennsylvania economist on the principles for determining the impact of the unauthorised use of intellectual property on

investment, technology transfer and innovation. The survey was on 100 companies in six industries operating in 16 countries. These findings are likely to figure in the final Uruguay round of talks and alter the GATT into a "Dunkel" Treaty?

There can be no dispute as the level and cost of research input for a successful product of large volume sales. The chemical and pharmaceutical industries feel far more aggrieved than others. An estimate is of $ 1.2 billion "losses" for chemicals and $ 1.8 billion on pharmaceuticals as against $ 292 million on metals and metal products for example. The "losses" are estimates of loss of sales at the US level of prices — not "profits". Chemical and pharmaceutical companies estimate tha patent protection is essential for 30% or more of the products.

The readiness to undertake joint ventures in countrie for production of patented drugs is linked to the exter of protection available so that a new local entrant is nc able to undercut. In India no product patents are grante for drugs, some chemicals, alloy optical glass. In Tha land there is no protection for chemicals, pharmaceut icals, food and beverages, agricultural products. In Braz there is exclusion of chemicals, pharmaceuticals an foodstuffs. India is not an isolated case and need nc be timid in fighting its case.

Isobutylene from n-butylene?

Lyondell Petrochemicals, USA have claimed to have developed a new cheap process for isobutylene by isomerisation of n-butylene. A mixed C4 stream from naphtha crackers can be conveniently converted into isobutylene which is in large demand for MTBE. Although n-butane isomerisation is known and used, this is th first of olefine isomerisation. Lyondell already mak MTBE with a capacity of 10,000 BBL and are lookin forward to finance for a demonstration plant of this nev process which would provide a basis for expansion.

Japan's cutbacks

There is some uncertainty in the Japanese production of some petrochemicals as a result of the rapid build up in the Asia Pacific region. After years of capacity/ demand for ethylene in balance at about 4.5 million tonnes there was a build up of additional capacity to reach about 5.5 million tonnes. The derivatives capacity has also gone up steeply. A recent analysis gives the global ethylene picture for 1992 as:

USA/Canada	- 20 million tonnes
Asia, Pacific & Japan	- 16 million tonnes
Middle East & Africa	- 6 million tonnes
West Europe	- 20 million tonnes
South America	- 4 million tonnes
East Europe	- 6 million tonnes

The polyethylene picture for 1992 and expected by 1995 in Asia Pacific region is as given in table alongside:

(Million tonnes

		1992	1995
LDPE	Capacity	2.55	2.93
	Demand	3.13	3.20
LLDPE	Capacity	1.42	2.60
	Demand	1.25	2.17
HDPE	Capacity	3.07	3.89
	Demand	3.01	3.88

Except for a small deficit in LDPE which Japan can cater to, there is little cheer for polyolefins in Japan as an export item. Styrene seems to be still a good bet for Japanese producers and capacity has been expanded recently.

But the further downstream petrochemicals also face a tough time. ABS has recorded negative growth — against a domestic demand of near 500,000 tonnes ar export of 100,000 tonnes in 1990 there is a fall of 1 2%. Margins have slipped and Taiwan has stepped u production and exports.

MMA is another resin which faces deep cuts of 10 15% after a growth of 9% a year between 1985 ar 1990. There was a capacity expansion in the wake the high growth rate but only to face bleak prospect Taiwan is again the hurdle.

Epoxy resins and engineering plastics are grow areas and new capacity for epoxy resins is being add to meet a demand of 162,000 tonnes. Polyacetal capa ity is being installed — 80,000 tpy with sizeable exp prospects.

Alcohol supply to be reviewed soon

The Maharashtra government is to review the 10 per cent cut imposed on alcohol allocations to industrial consumers. Though officials speak about surplus availability of alcohol this year, they are keeping their fingers crossed about the coming year in view of the drought conditions prevailing in the state.

The acreage under cane cultivation, which has been steadily increasing during the past few years thanks to generous monsoons, is expected to register a sharp fall during the year, leading to fears of deficit production of molasses and alcohol in the coming year. Apart from drought conditions prevailing in parts of the state, other compelling reasons are tempting the farmer to shift to horticulture in a big way, according to officials.

One of the factors is the incentives given for drip irrigation to optimise scarce water. The other factor is that horticulture produce can be sold directly and even exported, without the need to undergo industrial processing as in the case of cane. Farmers, especially in northern Maharashtra are said to be switching from cane to grapes, a high value product. Those exporting table grapes are getting good prices from the world markets.

Meanwhile, the possibility of decontrol of molasses and alcohol continues to exercise the attention of concerned industries. **Mr. Shanti Bhushan,** senior advocate at the Supreme Court, who was approached by some people, has given his legal opinion on the matter. According to him, the mere repeal or supercession of the molasses control order by the Central government would not obliterate the state Acts and the control over molasses under the provisions of the state.

Molasses are products of the sugar industry which is one of the Union controlled industries under the IDR Act of 1951. As such, production, distribution, trade and commerce in molasses will fall under entry 33 of the concurrent list and would cease to be covered by entries 26 and 27 of the state list. So far as entry 33 of the concurrent list is concerned, Parliament as well as state legislatures are competent to legislate on the same. Article 254 of the Constitution, however, provides that in case of contradiction between the law enacted by Parliament and the one enacted by state legislatures, the law made later and assented to by the President will prevail.

"The UP Sheera Niyantran Adhiniyam of 1964 was not only a later law but it also received the assent of the President. Its provisions would prevail over the provisions of the Molasses Order of 1961. The same may be the position in some of the other states where Acts similar to the Act of 1964 may have been enacted with the assent of the President," Mr. Shanti Bhushan opined.

NEW BORAX UNIT COMING UP IN SURAT

Hindustan Alloys Mfg. Co. Ltd. (Hamco), having a turnover of Rs. 100 crores per annum, is launching a new company, Nariman Point Chemical Industries Ltd., to manufacture and market boric acid and borax.

The Rs. 495.10 lakhs plant has been set up at Tadkeshwara village in Surat. The company's products are being marketed under the brand name 'Hindustan'. Boric acid and borax are basic inorganic chemicals and find extensive use in various industries, such as, pharmaceuticals, metallurgical, fibre glass, pottery enamelling and glazed tiles. The glass industry is a major consumer of borax with 35 per cent share in the total consumption. Boric acid is a major raw material for the fibre industry.

The products have been well received in the market. The clientele includes Asian Paints Ltd., Rallis India Ltd. Cadbury India Ltd., Phillips India Ltd. Johnson and Johnson India Ltd., Fibre Glass Pilkington and others. During the trial production, carried out recently, the company has seen a turnover of Rs. 11 lakhs and orders worth Rs. 15 crores fo 1992-93 are already in hand.

The company also proposes to expor 40 per cent of borax and boric acid t Germany, Belgium and Russia. Th company's installed capacity is 9,00 tonnes of borax and 3000 tonnes o boric acid.

Promoters will be contributin Rs. 128 lakhs, public issue will be Rs. 192 lakhs, subsidy Rs. 25 lakhs a term loan from GIIC Rs. 150 lakhs. T part finance the project the company entering the market with 19,20,0 equity shares of Rs. 10 each for cash par on May 11.

The parent company, Hamco, engaged in manufacture and marketi of aluminium alloys/ingots, aluminiu anodes, tin, soft solder, lead alloys, le strips, pipes and other related produc The turnover of the company h increased from Rs. 862.54 lakhs 1985-86 to Rs. 2,969.23 lakhs 1990-91. In earned Rs. 2,338 lakh foreign exchange for the same year paid a dividend of 30 per cent in 19 and the promoter, **Mr. B.M. Patel** well associated with the non-ferr metals industry.

GUJARAT SULPHITES' NEW PROJECT

Gujarat Sulphites Ltd. is settin Rs. 8.05-crore project at Panoli, G arat, for the manufacture of sulphu acid, oleum, sulphate salts of sodi and dye intermediates. The other gr companies — PAB Chemicals Priv Ltd. and Gujarat Electromelt Pvt. L — have a combined turnover of Rs. crore. The company is planning to e the capital market soon to part fina the project.

HDC planning diversification into acrylates, polymers

Hindustan Development Corporation (HDC) has chalked out a comprehensive diversification programme according to a report in *The Business & Political Observer*. It proposes to set up a plant for the manufacture of import substitutes like cyanuric chloride used in dyes, textile and paper industry, which despite bulk imports is in short supply in India. It has also decided to set up a methacrylate and poly methacrylate project based on hydrocyanic acid.

Petrocarbon and Chemical Company, a unit of HDC, is implementing a project for manufacturing caustic soda at Haldia with a capacity of 50,000 tpa at a cost of Rs. 5 crore. It will be incorporating the ultra modern and economical state-of-the-art membrane technology, which is considered as highly energy efficient. Electricity is the main input in manufacturing caustic soda and at present only 10 per cent of the total caustic soda production in India is through this technology. Though it is a comparatively expensive technology, it proves to be a highly economical one in the long run.

Demand for caustic soda is expected to go up sharply once the huge Haldia petrochemical project comes up. This project is expected to be implemented by 1994. Rising demand for caustic soda in Indian as well as in world markets alongwith plant's ideal location at Haldia will go a long way to ensure the bright prospects for this project, which in turn will bring in healthy profits for the corporation.

Another unit of HDC, Cyanides & Chemicals Company, is producing a number of import substitutes, like hydrocyanic acid, sodium cyanide etc. Potassium ferrocyanide, an import substitute, has been developed at its R & D centre and possibilities are being explored to produce this chemical on commercial scale. Astutely managed by a team of professionals led by **Mr. R.P. Mody**, HDC has been consolidating and upgrading its existing line of operations alongwith venturing into strategic diversification schemes, instead of blindly chalking out huge and ambitious diversification plans with no emphasis on consolidation and upgradation of existing line of activities which often put pressure on a company's bottom line.

The company is producing a host of products catering to the needs of core sectors like railway wagons, steel castings, power transmission and telecommunication wires, high tensile insulators, calcined petroleum coke, jute, cyanides and now steel.

The previous financial year has proved to be the most profitable one for the company till date. The sales turnover has risen by 24.2 per cent to Rs. 331.82 crore from Rs. 267.23 crore. Net profits before depreciation and taxation show an impressive jump of 44.9 per cent to Rs. 54.01 crore from Rs. 37.28 crore in 1990-91. Depreciation amounts to Rs. 19.34 crore against Rs. 15.34 crore and taxation Rs. 2.91 crore against Rs. 5.80 crore. Residual profits have witnessed a whopping jump of near 100 per cent from Rs. 16.14 crore to Rs. 31.76 crore, resulting in an EPS close to face value.

Dividend has been maintained at 20 per cent for the third consecutive year. Retained profits are higher at Rs. 25.27 crore against Rs. 10.50 crore. The price of Rs. 140 recorded on April 13, 1992 at the Calcutta Stock Exchange (CSE) discounts with EPS only 15 times. The company came out with an issue of partly convertible bonds amounting to Rs. 300.71 crore in February this year to finance its most ambitious Rs. 380 crore composite steel project at Malanpur near Gwalior, Madhya Pradesh in technical collaboration with Hamburger Stahlwerke GmbH of Germany, for the manufacture of 2.5 lakh tpa of shaped products, alloy steel and other special steels.

It is scheduled to be on stream shortly. Conversion of these bonds will take the equity to Rs. 72 crore from Rs. 32 crore in the next 18 months, but the Rs. 380 crore project will boost sales turnover to well over Rs. 700 crore and profits to over Rs. 100 crore.

This composite steel complex is fully automated using AEG Westinghouse automation systems with computerised and user-friendly operator interface for controlling and setting up mill rolling parameters; computerised alarm logging and reporting systems and flexibility for further integration with higher level computer systems. A substantial portion of the production will be utilised for captive consumption for company's steel intensive and steel consuming activities.

ALPS LABORATORIES PLANS EXPANSION

Alps Laboratories Ltd. proposes to expand its existing formultion capacity and introduce new formulations in the form of liquid orals, dry powders, ointments and herbal medicines. The Rs. 6.65-crore project will be financed by equity capital of Rs. 2.10 crore by way of promoters' contribution and Rs. 3.15 crore by way of public issue.

The company will enter the capital market with a public issue of 31.50 lakh equity shares of Rs. 10 each for cash at par. Phase one is likely to be commissioned in August 1992 while phase two of the Rs. 4.38 crore diversification programme proposes to make life-saving antitubercular and antibiotic bulk drugs like Rifampicin, Pyrazinamide, Cephalexin and Cloxacillin. The formulation plant is situated at GIDC-2 in Mehsana.

Import duty on p-xylene may come down

The controversy over reduction of import duties on paraxylene has taken yet another twist reports *The Economic Times*. The ministry of chemicals and petrochemicals is now not averse to a reduction in import duty rate on para-xylene from the existing 85 per cent to a more "reasonable" level.

The Indian Petrochemicals Corporation Limited (IPCL), however, is reportedly lobbying hard against such a reduction, saddled as it is with 15,000 tonnes of unsold para-xylene stocks. Importantly, Mr. Nusli Wadia, chairman of Bombay Dyeing was again in the capital early last week, campaigning for a duty reduction. He has had a meeting with the minister of state for chemicals and petrochemicals, Dr. Chinta Mohan. Mr. Anil Ambani of Reliance Industries Limited (RIL), was also reportedly in the capital but a spokesman of the company claimed that Mr. Ambani had absolutely nothing to do with the para-xylene controversy. "He is here to talk about a Japanese venture."

Meanwhile, the ministry has decided to support a Rs. 450 crores Bombay Dyeing project to make 90,000 tonnes of paraxylene and two lakh tonnes of benzene, either at Mangalore or at Visakhapatnam. If the raw material, naphtha, is not available domestically for the project, the ministry is likely to pitch for imported naphtha, provided it is foreign exchange neutral.

According to highly placed sources, besides IPCL, Reliance Industries is also reported to be opposed to a reduction in the duty rates of para-xylene. But a Reliance spokesman clarified that this is not true because the company's giant one lakh tonne para-xylene plant is almost entirely used for internal consumption. Mr. Wadia has argued that because of the reduction in duty rates of PTA and DMT in the last budget, their prices have come down. In this context, there is no rationale in keeping the price of the raw material, para-xylene, fixed at the earlier level of 85 per cent. The duty rate should come down proportionately, according to him.

According to highly placed sources, Bombay Dyeing had earlier demanded a study of the manufacturing cost of IPCL's para-xylene to find out whether the price of around Rs. 24,000 per tonne charged by the public sector company is fair or not. It is now quite likely that, with mediation from the top, a sort of "deal" may be worked out between the two companies, which may lead to reduction in IPCL's para-xylene prices, but not to the extent earlier desired by Bombay Dyeing.

In effect, the so called "loss" to both — IPCL getting a lower than desired price while Bombay Dyeing pays a higher than acceptable price — will be shared equally. In any case, IPCL's objections are expected to lead to a one shot benefit only as it is unlikely to hav[e] surplus para-xylene for sale — all of i[t] from now on is likely to be utilised t[o] make DMT in-house.

DYE-INTERMEDIATE UNIT TO DIVERSIFY INTO PHTHALOCYANINES

Shreyas Intermediates, which has se[t] up a dye intermediate plant to manufacture 600 tonnes per annum at Lote Parshuram in Maharashtra, has embarked on an expansion programme. The company has commenced the first phase of its plant and its products — DASDA, H. acid, gamma acid etc. have been well received both in domestic and export markets like Germany, USA, UK and Far East. The first phase was completed with financial assistance from SICOM.

The company is planning to diversify into manufacture of phthalocyanine range of products. The second phase is estimated to cost Rs. 424 lakhs.

Balaji Amines to make pyridine, picolines

Balaji Amines Ltd. of the Bhagyanagar group is to manufacture pyridine, picolines. The group has entered into an agreement for the transfer of technology and manufacture of these chemicals with the CSIR scientist, **Dr. P.S. Murthy.**

The pyridine plant will be set up at the existing factory site in Osmanabad district. The company will be exempted from sales tax for seven years and an amount of Rs. 30 lakh will be available towards state investment subsidy. Bagasse available in nearby factories will be used as fuel for the boiler. The total project cost for the manufacture of 100 tpy of pyridine/picolines is Rs. 1,650 lakh which is under appraisal by central financial institutions.

The product is mostly used as a solvent and in the manufacture of intermediates, drugs and pesticides. The total demand for pyridine/picolines in India is 2,500 tpy out of which only 1,170 tpy is being manufactured in the country. The demand is expected to grow because of the potential in the manufacture of cyanopyridines and vinyl pyridines.

Balaji Amines presently operates a plant for the manufacture of methylamaines, a high technology product, and has utilised 55 to 60 per cent capacity in the first year of operation. The company has shown a gross profit of Rs. 80 lakh against the paid up equity share captial of Rs. 130 lakh with EPS of Rs 2.36. The company will shortly approach the public to part-finance the pyridine project.

INDIA DELAYS SIGNING MONTREAL PROTOCOL

India has delayed signing the Montreal Protocol on phasing out of ozone-eating chemicals as the London amendments on the transfer of technology and additional funds have not been ratified by the required number of parties to the protocol. The country was to formally join the protocol during the 10-day working group meeting, which concluded in Geneva recently. The London amendments have so far been ratified by 19 countries, one short of the minimum required.

The signing is now likely to take place during the ministerial meeting to review the protocol, scheduled to be held in November in Copenhagen. Officials said that the meeting would also consider amendments recommended by the Geneva meeting, which include speeding up the reduction process for the harmful substances, including chlorofluorocarbons (CFCs).

Under the Geneva amendments, the phasing out of CFCs and other ozone-depleting substances has been proposed to be achieved by 1996, four years ahead of schedule. The Geneva meeting was attended by officials from 56 countries, including India. The meeting suggested further amendments even though those proposed in the previous meeting in London have yet to come into force.

If the new amendments are accepted, India too will have to speed up its CFC phase-out plans. Since developing countries, under the provisions of the protocol, have 10 years more than the industrialised nations to phase out CFCs, India will have to stop production of these substances by 2006 instead of the present deadline of 2010. The Geneva amendments assume significance as the US and the EC have already unilaterally announced their plans to phase out CFCs, halons and other such chemicals by 1995, five years ahead of schedule.

The US has urged other countries also to speed up the phasing out, a move spurred by latest scientific data on depletion of the protective ozone layer. Besides recommending speeding up the phase-out, the Geneva meeting also suggested phase-out of certain short-term CFC substitutes such as HCFCs as these are also ozone-depleting. It also wanted restrictions to be put on the production and use of bromine-based chemicals, including methyl bromide, which is used as a base in agricultural fumigants.

Experts say that India, having decided to join the protocol, should not delay doing so as valuable time would be lost for the refrigeration industry, which will suffer the most from CFC phase-out. Other industries expected to be affected include the foam-blowing industry, the manufacturers of fire extinguishing chemicals, and the electonics industry.

China, which joined the protocol after the London amendments, has already initiated research work, utilising the funds made available to it from the financial mechanism set up for the purpose.

SMX UNIT COMING UP IN MP

Hi-tech Drugs Ltd. is to enter the capital market with a public issue of Rs. 2.50 crores to part finance its project for the manufacture of various bulk drugs viz. sulphamethoxazole (SMX) and diclofenac sodium.

The unit, set up at a total cost of Rs. 4.75 crores, at Ratlam in M.P. will also produce 3,4,5-trimethoxy benzaldehyde, sulphadiazine and N-acetyl sulphanilyl chloride. The company has entered into a long term export contract with Cibatul Limited, a subsidiary of Ciba Geigy, Germany, for the export of these drugs, according to a press release. Trial production has already commenced.

The company has export orders worth US $5 lakhs and has projected a turnover of Rs. 13.50 crores in the first year with 70 per cent from exports. It has declared a 15 per cent dividend on its estimated 1991-92 results with an EPS of Rs. 5.49.

Seminar stresses bio-degradability of LAB

Linear Alkyl Benzene (LAB) is environment-friendly and completely bio-degradable, pointed out foreign and Indian experts at a technical seminar held in New Delhi on April 28 to discuss this subject.

LAB is the most widely used raw material for detergents manufacture, and commands over 80 per cent of the market world wide and over 95 per cent of the market in India. The seminar was sponsored by the Indian Petrochemicals Corporation Ltd. (IPCL), Tamil Nadu Petroproducts Ltd. (TPL) and Reliance Industries Ltd. (RIL). International technical experts from Petresa and UOP also presented papers at the seminar. Other participants included experts from academic institutions, environmentalists and small and large detergent manufacturers.

LAB manufacturers said that certain lobbies had recently suggested to the government that the use of LAB should be discouraged in favour of the more expensive alpha olefin sulfonate because LAB biodegrades only 92 per cent in seven days in comparison to AOS which degrades fractionally faster in the same period. They said the government's existing 92 per cent biodegradability criteria was already far more stringent than existing standards in use in developed countries which varied between 80 to 90 per cent. The move to question LAB's biodegradability factor, they said, seemed to be aimed at helping only one manufacturer to launch and market his product at the cost of existing LAB capacities. The Environment Ministry, in a notification for eco-labelling of products in November 1991, had stipulated a minimum bio-degradability of 92 per cent for surfactants used in household detergents. According to papers presented at the seminar, it was stated that LAB bio-degrades 100 per cent in nature in about 25 to 30 days. When tested in the laboratory, LAB decomposes by 92 per cent in the first seven days, thereby fully meeting the requirements of the environment ministry's notification.

At present the biodegradability is measured as per the Bureau of Indian Standards (BIS) test method No. IS-12795-1989. This is an accelerated laboratory testing method without taking into account natural bio-degradability factors outside the laboratory.

Experts pointed out that LAB had been a highly investigated chemical all over the world as far as its impact on the environment is concerned. It was interesting to note that current concerns in India vis-a-vis the safety of household detergents are similar to concerns which were taken up in the west about ten years ago. The issue was then settled by declaring LAB environmentally safe when no traces of LAB were found in nature even after its extensive usage for over 30 years. Experts stressed that bio-degradability testing currently prescribed by BIS is not fool-proof and is subject to wide variations in results. As a matter of fact, countries in the west are switching over to advanced methods of testing which eliminate inherent variations of the process.

IIChe TO HOST SEMINAR IN BOMBAY

The Indian Institute of Chemical Engineers (IIChe) has organised a one-day seminar titled "Globalisation of Indian Chemical Industry: Opportunities and Challenges", on May 8, 1992, at the Taj Mahal Hotel, Bombay. The seminar will analyse the far reaching changes which have come about in recent times and the impact and opportunities they pose to the chemical industry. The areas of concern, such as the debate over intellectual propery rights (IPR) and its impact on the drug industry will also be addressed. The seminar will be inaugurated by **Mr. S.M. Datta,** Chairman, Hindustan Lever Limited and the three technical sessions will be chaired by **Mr. Humayun Dhanrajgir,** Managing Director, Glaxo India, **Dr. A.N. Dravid,** Managing Director, Humphreys and Glasgow Consultants Pvt. Ltd., and **Mr. K.P. Mohandas Rao,** Managing Director, Hindustan Dorr-Oliver Ltd.

Speakers at the seminar include: **Mr. V.R. Deenadayalu,** President, RPG Group; **Mr. Satish Rajgondwar,** General Manager, Roussel India, Bombay; **Dr. Joe Thomas,** Director, SPIC, Madras, **Dr. P.G. Hebalkar,** Managing Director, Profitech Consultants, Bombay, **Mr. Z.F. Lashkari,** Vice-President, Polyolefin Industries Ltd., Bombay, **Mr. R.L. Dalal,** Managing Director, Dalal Consultants Ltd., Bombay, **Mr. C. Balaraman,** (Deputy General Manager) and **Mr. R. Natarajan,** (Manager), Hindustan Dorr-Oliver Ltd., Bombay.

For further details contact: Dr. G.D. Yadav, Hon. Secretary, Indian Institute of Chemical Engineers, (BRC), C/o. Department of Chemical Technology, University of Bombay, Matunga, Bombay-400 019. Fax. 414-5614, Telephone : 411 2391, 414 5616.

ALKYL AMINES TO MAKE DIMETHYL ACETAMIDE

Alkyl Amines Chemicals has decided to set up a plant to manufacture dimethyl acetamide at Kurkumbh in Pune. The cost of the project is estimated at Rs. 10 crores and it will have a production capacity of 3000 tonnes per annum. The company has decided to obtain technology from the proprietor of Srinivas Consultants for the manufacture of dimethyl acetamide. According to **Mr. P.S. Murthy,** Managing Director, Srinivas Chemical Industries and Srinivas Consultants, dimethyl acetamide manufactured at its plant in Tarapur has a limited capacity of about 200 tonnes and since there is no scope for further expansion, this step has been taken.

Haryana Government approves bulk drug unit

The Project Approval Board (PAB) f Haryana has approved the implemen- ation of eight new projects with a total nvestment of Rs. 133 crore. The board net in Chandigarh on April 22 under he chairmanship of **Mr. Bhajan Lal,** Chief Minister, Haryana. The invest- ment of Haryana State Industrial Devel- opment Corporation (HSIDC) and Hartron in these projects will be Rs. 3.49 crore and Rs. 23 lakh respec- tively. On implementation, the projects will generate direct employment for over 1800 persons.

The new projects cleared by the PAB included two 25,000 spindles cotton/- acrylic yarn projects to be set up in Sirsa in Gurgaon district of Haryana, a phar- maceutical project for manufacture of 7 ACA and its derivatives besides aspertame, griseofulvin and captropril, and 100 per cent export oriented terry towels project. Four projects promoted by Hartron were also approved by the PAB. These include electronic quartz clock movement, integrated design software development and application centre, micro computer based instru- ments and a project for manufacture of sheet metal components for electronic and telecom industry. The spinning mill at Gurgaon is being set up by **Mr. B.R. Arora** of Jai Mata Rolled Glass Ltd., while the Sirsa spinning mill is being promoted by **Mr. Sandeed Ahuja** of Regal Polymers Ltd. A 100 per cent export-oriented terry tower project is being jointly promoted by HSIDC and **Mr. Arun Gupta** of Varindra Agro Chemicals Ltd. This shall be the first project of the group in Haryana.

Mr. V.K. Garg who has successfully implemented Munak Chemicals and Alpha Drugs will be the co-promoter of 7 ACA project. The product range to be manufactured by this unit is based on a technology which has been brought for the first time in the country.

While reviewing the functioning of HSIDC, Mr. Bhajan Lal expressed sa- tisfaction at the pace of industrialisation which has been achieved after the implementation of the new industrial policy of the state. The HSIDC had promoted 25 projects catalysing an investment of Rs. 153 crore till March, 31 1991. As against this, 15 projects have been promoted after the new indu- strial policy was announced. The investment to be catalysed through these projects would be Rs. 335.50 crore.

In addition, six projects are at an advanced stage of implementation which will catalyse an investment of Rs. 108.50 crore. The projects imple- mented by HSIDC would generate direct employment for about 11,000 persons and indirect employment for many more.

S S Drugs plans unit at Moradabad

S S Drugs Ltd. proposes to set up a plant to manufacture 40 mt of cephalexin and 48 mt of mebendazole per annum at the Uttar Pradesh State Industrial Development Corporation (UPSIDC) industrial area at Gajraula in Moradabad. It will also be expanding the plant capacity to manufacture 7 ADCA from penicillin-G potassium.

The company has so far incurred a capital expenditure of Rs. 60 lakh and expects to start commercial production by October 1992. The company has tied up for indigenous technology with reputed consultants in the field and placed orders for major plant and machinery and other equipment.

According to a press release, cephalexin is a semi-synthetic antibiotic finding wide spectrum medical applications. It is manufactured from 7 ADCA, which the company proposes to manufacture later on. This is expected to provide the company the advantage of in-house supply of raw material, thereby giving its products a price advantage in the market.

Mebendazole is a safe and versatile spectrum anti-helmentic agent. It is used against a large variety of helmentic infestations like escariasis, enterobiosis, hookworm infestation and tape worm, and finds application for both human and veterinary treatment. Exports of cephalexin from India rose sharply to Rs. 15.70 crore in 1990-91 from a mere Rs. 3.75 crore in 1987. The main export markets are UK, Germany, Russia, Philippines and Nigeria.

The export demand for mebendazole has also shown a three-fold increase from 41 mt in 1985-86 to 133.70 mt in 1988-89. And with the devaluation of Indian rupee the world is increasingly looking towards India for these vital drugs, giving a further impetus to the expots, says the press release. Besides catering to the inhouse requirements, 7 ADCA proposed to be manufactured by the company also has a very good market potential. To part-finance the project cost of Rs. 5 crore, the company proposes to enter the capital market shortly. SS Drugs' plants, are versatile enough to manufacture other high value antibiotics like ampicillin, amoxycillin and cloxacillin — all of which command a good export market.

Further more, even in the local market there exists a good demand-supply gap for the company's products and the gap is expected to grow much wider in the coming years. The company has been sanctioned loans from PICUP and UPFC and has started construction of building. It has also received various clearances from government boards.

MAX INDIA DIVERSIFYING INTO PHARMACEUTICALS

Max India Ltd., a Bhai Mohan Singh group company, is diversifying into a new business area of speciality pharmaceuticals. The areas which the company will be entering include formulations for cardiovasculars, antibiotics, quinolones, anti-peptic ulcerants, non-steroidal anti-inflammatory drugs and antihistamines. Max India, according to the Managing Director, **Mr. Analjeet Singh,** will build on its foundation of being a busi-ness leader in the area of bulk drugs and drug intermediates and will consequently strengthen its position and market standing.

Mr. Singh told newsmen in New Delhi on April 21, that the company will initially launch a selected range of products in the north and the south over a phased programme. By the end of the year its operation will extend to the rest of the country.

Mr. Singh said that in their plans to develop its pharmaceutical business, an important contributor was Max India's acquisition of Ranbaxy's first plant at Okhla, New Delhi. The plant is now called Pharmax Corporation Limited and it conforms to World Health Organisation (WHO) standards of good manufacturing practices. Max India has invested over Rs. 2 crore in upgrading and modernising plant facilities. Mr. Singh said that while Max India will market products under its brand name these products will be manufactured by Pharmax Corporation Limited.

Max India commenced its export of pharmaceutical formulations last year into the markets of Europe. This year that geographical territory is being enlarged to cover the markets of Nigeria, Kenya, Srilanka and south east Asia. The product range for exports includes generic and branded specialities. Mr. Singh said that the addition of the pharmaceutical business group to its existing activities will ensure a group turnover of over Rs. 150 crores by the end of 1993.

At present the company has a total sales of Rs. 75 crores which is up from Rs. 48 crores last year. The cash profit before tax stood at Rs. 6 crores this year, Mr. Singh said. He said that all other expansion plans of entering the telecom arena with value added services in joint venture with Hutchison of Hong Kong and plans for fermentation of penicillin-G and cephalosporin-C are progressing well.

APPOINTMENTS

Hero J. Chuganee, Chief Executive of Indofil Chemicals Company, has been appointed as Chairman — All India Manufacturers' Organisation, special council for chemicals and petrochemcials.

Mr. T.V. Thyagarajan has taken over as the Director (projects) of Engineers India Ltd., (EIL), the largest design and engineering organisation in the country. Mr. Thyagarajan had joined EIL in 1968 and was group General Manager before assuming his new charge.

Prices of imported medicines soar

Imported medicines, including those equired in the treatment of cancer, have one beyond the reach of patients ecause banks are calculating the price t the market rate of dollar reports *The Economic Times.*

A government circular of February 29 ad said that "life saving drugs", to be isted out by the Secretary of Economic Affairs, would be allowed to be mported at the official exchange rate.

A list of 200-odd drugs and intermediates is said to have been prepared out is yet to be released because the officials are preoccupied with more mportant matters.

Prices of branded drugs abroad bear no comparison to Indian prices. Import at market rate has made things even more difficult for Indian patients. "Even f they release the list tomorrow, who will compensate us for the loss in importing intermediates for drugs like anti-tubercular rifampicin, which we imported at market prices during the last two months?", asked a frustrated manufacturer.

Rifampicin price is Rs. 4,946 a kg but devaluation and partial convertibility has pushed up cost of production to Rs. 6,000 level, according to producers.

Revised prices for ampicillin, amoxycillin

Meanwhile, the government has announced revised prices for ampicillin and amoxycillin bulk after a lapse of six months. Ampicillin price has been pegged up from Rs. 2,216 to Rs. 2,516 a kg and amoxycillin price has been revised from Rs. 2,649 to Rs. 2,922 a kg.

Manufacturers contend that the revision will hardly make up for the increased input costs on which they have submitted documented proof.

In the case of ampicillin for example, the cost of raw materials like penicillin, phenyl glycine and methylene chloride alone adds up to more than Rs. 3,000, they said. As bulk drug producers cannot afford to sell at the notified prices, most of them have been recovering part of the cost through the mechanism of debit note.

The department has now sent notices to hundreds of manufacturers asking as to why action should not be taken against them for overcharging. Interestingly, excise officials are asking producers how they can sell at notified prices when the raw material prices exceed the notified prices.

As such, many excise officials are insisting on levying duty on actual costs plus profit margin.

MP drug units concerned over sales-tax hike

The Madhya Pradesh Government has raised sales tax (ST) from three to six per cent leaving drug manufacturers and wholesale chemists and druggists in a quandary.

The wholesalers in MP are demanding that the three per cent additional sales tax be reimbursed by manufacturers as it is cutting into their pockets. Drug manufacturers, on the other hand have expressed helplessness at the situation saying that they are already saddled with abysmal margins, with what Government sitting tight on their price revision applications.

The problem stems mainly from the stipulation by the Ministry of Civil Supplies and Distribution that all non-scheduled drugs, packed after January 1, 1992, carry the sale price as "Maximum Retail Price..., inclusive of all taxes". Consequently, the two premier associations of the industry viz Organisation of Pharmaceutical Producers of India (OPPI) and the Indian Drug Manufacturers Association (IDMA) had jointly worked out broad guidelines for calculating the maximum retail price (MRP). It had been decided that there would be one Uniform Consumer Price (UCP — retail price inclusive of all taxes) and that the net invoicing price (price at which manufacturer will invoice their products sold to the wholesalers) would be worked out differently for every State and Union territory, depending on the rate of sales tax prevailing there.

Manufacturers, therefore, have to maintain different price lists for various states. Moreover, UCP has been worked backwards taking into consideration the net invoicing price for wholesalers. This means that every time any state or Union Territory changes its ST, the UCP will have to be reworked. Vexed drug manufacturers have filed a writ in the Madras High Court on the issue. Industry sources say that IDMA is likely to file a supplementary to the writ explaning the situation in detail and asking that the court direct the Government to file its reply within a stipulated time period.

WIPRO BIOMED TIES UP WITH US FIRM

Biotechnology research in the country will get a boost with a leading US-based multi-national entering the Indian market with a wide variety of sophisticated scientific equipment.

Wipro BioMed, one of the business units of the Rs. 600-crore Wipro Corporation, has announced its tie-up with Bio-Rad Inc USA, world leader in the field of electrophoresis, chromatography and kits used in bio research.

The Indian firm, which is in the manufacturing business, will for the first time confine itself to marketing of sophisticated instruments manufactured by its American partner.

A Wipro spokesman said the company expected to generate business worth $1 million. With more than 150 institutions, including some leading pharmaceutical firms undertaking biotechnology research in a big way, the availability of sophisticated equipment with the latest art of technology would give a big boost in the area of life sciences, he added.

Mr. Rajiv Dutta, vice-president, business development of Bio-Rad, said that the Indian scientists were recognised the world over for being at the leading edge of biotechnology research. Bio-Rad hopes to provide tools and systems to further enhance India's capability in meeting challenges in the fields of biotechnology, environmental research, medical and plant genetics.

Drug licensing policy likely to be delayed

The Prime Minister's directive at a cent review meeting on drugs to rely ore on fiscal than physical barriers has ogged down the drug licensing policy nce again.

The ministry of chemicals and petro-hemicals is at a loss to translate the M's views on the policy into practical roposals, although a move is afoot to onsiderably scale down the original ost of 63 bulk drugs that were sought be kept under a licensing regime. hese were to have been subjected to anufacture for a notified stage because these drugs producers may be tempted to regress to late stage imported enultimates.

On account of the Prime Minister's iew that fiscal incentives should play more important role in ensuring that uch regressions do not happen, late tage intermediates should be levied a igher graded duty rate structure. But his exercise is not expected to be ntirely feasible as it seems to go against he government's general policy of ringing down the average tariff rates n the economy as a whole.

In any case, it is argued that import duty rates on a sizeable number of intermediates are already at the existing ceiling rate of 110 per cent, a further increase may become difficult. Under the circumstances, a graded fiscal barrier to stop regression to late stage intermediates, without resorting to licencing, is turning out to be a difficult proposition.

A similar attempt to encourage early stage manufacture by manipulating the excise duty structure is also running into rough weather. A differential excise duty system, with higher duties on late stage manufacturing, may send the wrong signals to the end user. Importantly, such a complex excise duty structure may become extremely difficult to monitor and implement. Further, confusion may arise in the pricing of the end product, because of the differentials as end product manufacturers may have to be forced to buy intermediates at varying prices.

But in keeping with the PM's opinion, an exercise has been mounted to look at those intermediates which still do not attract the ceiling rate of import duty and it is likely that rationalisation of these duties will be attempted. A comprehensive analysis of the excise duty structure on bulk drugs will also be undertaken.

Some of the key features of the earlier policy are expected to remain in place. Formulations will be exempted from licensing. Existing mandatory conditions like supply of a percentage of bulk drug production to non-associated formulators and observance of ratio parameters linking bulk drug with formulation activities are being abolished. A new broad banding scheme will permit the manufacture of any item in any existing unit with additional balancing equipment, on par with Indian companies. The Ministry of Chemicals and Petrochemicals had earlier prepared a single drug policy which sought to combine the licensing and pricing aspects of the industry. But strong political opposition on some of the pricing proposals not only delayed the policy, but a decision was taken to split up the policy into two parts — one dealing with the pricing aspect and the other with the licensing norms.

The Prime Minister has emphasised that quick processing of the licensing policy has become imperative following the announcement of the new industrial policy last year. The policy, while de-licensing large segments of the economy, kept drugs and pharmaceuticals under a licensing regime that will be independently worked out by the Department of Chemicals and Petrochemicals.

Ecomark unlikely for pesticides

Pesticides may be withdrawn from the list of 16 items selected for granting the Ecomark labelling scheme as many experts feel that because of its inherent poisonous nature, it cannot be fully environment-friendly.

Environment Ministry sources said though many experts questioned the desirability of even considering Ecomark for pesticides at the sub-committee meeting on the subject on April 21, the general specifications for granting the mark had been decided. The Minister of State for Environment, **Mr. Kamal Nath,** too is not keen on the inclusion of pesticides and has directed that it be dropped from the list.

In April 1990, the Ministry of Environment mooted the scheme to grant environment-friendly label, similar to the quality mark, ISI, and 16 items were identified. The minimum specifications for each item have been worked out and the scheme is likely to take off from May. At recent meeting, many experts pointed out that pesticides should be accepted with their risks and economic benefits and environment-friendliness of these chemicals were difficult to point out. Further, it was extremely difficult to monitor its use.

It was pointed out that though a pesticide might not be harmful, a large number of raw materials and intermediate products used in the manufacturing process were hazardous to humans and the environment. An example is the methyl isocyanate (MIC), the poisonous gas which is an intermediary in making pesticides, and its leakage in Bhopal in December 1984 killed over 2,000 people in the world's worst industrial disaster.

Another expert said pesticide, now used in a controlled manner and stored with great caution, might gain respectability if Ecomark was given to it. Ecomark could also induce complacency in its handling and elaborate safety guidelines might get a short shift. Though the country had a tough Indian Insecticides Act, 1968, which regulated the import, manufacture, sale, transport and distribution and use of pesticides, several loopholes in the law and non-cooperation of the industry had resulted in its tardy implementation, the meeting was informed.

There are 132 pesticides granted provisional registration under the Act till now. Enormous amount of data on the use and impact on the environment and humans and other living forms are required and full clearance was withheld pending supply of relevent information by the manufacturers.

Consequently, only 13 pesticides had got conditional full clearance, and other manufacturers had evaded their responsibility in this regard, an expert said. The Central Insecticide Board is not legally empowered to demand the requisite data from manufacturers.

Scientific data on the effect of pesticides when inhaled by living organisations are available only for five of the 132 registered products. Two expert committees which studied the impact of pesticides on the environment and human health in the last ten years had recommended improving the national surveillance methods.

Members said some pesticides should not be considered at all for the Ecomark. These are those classified as highly dangerous by the UN's World Health Organisation. The majority of the data available on pesticides are from sources in the industrialised countries. Experts have stressed the need to generate adequate information on toxicity and other relevant data on pesticides in the Indian conditions before going ahead with Ecomark labelling. Among the committee's specifications for qualifying for the mark, decided recently, are that at least 95 per cent of any pesticide should degrade within 30 days of exposure to the atmosphere.

IDENTIFICATION OF ONE OF THE MAJOR GENES OF DIABETES

A team of scientists from the French National Institute for Health and Scientific Research — INSERM — have identified and localised one of the major genes of diabetes, a result which, ultimately, could enable intervention even before the illness surfaces, by identifying those who are at risk from the disease and proposing treatment for them. 15-20% of diagnosed diabetic cases are the insulin-dependent kind. This illness is characterised by the self-destruction of the production centre for cells which secrete insulin in the pancreas. "The emergence of insulin-dependent diabetes is linked to the simultaneous presence of several genes, 4 or 5, of which none are in themselves pathological, but which, in combination, are responsible for the disease," explained **Prof. Jean-Francois Bach,** head of the research team.

To explain the gene's action mechanism and its role in triggering the disease, the French researchers worked on mice which, according to them, are excellent animal models for human diabetes and on them, they proceeded to work on a study of the pancreas before emergence of the disease. They perceived that at the earliest stage of disease, the cells infiltrate into the pancreas and proceed to provoke inflammatory lesions (periinsulitis). These cells, at the same time, attack other glands, particularly the salivary ones.

For the INSERM team, there is no longer any doubt that these two inflammations are coded by the same group of genes and that diabetes is triggered off due to the chain action of several genes: "The first sets off the entry into the pancreatic cells, the second identifies the target and the others serve to wrap up the entire mechanism", explained Prof. Bach.

UK collaboration for pest control products

Biosense Crop Protection (India) Ltd. a company promoted by Good Value Marketing Company Ltd. will be entering the capital market with a public issue of Rs. 8.97 crore to meet the cost of its project to manufacture highly advanced biological products that will protect crops from insects and diseases.

These products will be made in technical collaboration with Russell Fine Chemicals, UK and Technoverde Ltd. of UK. These insecticides will leave no chemical residues on crops. They are environmentally safe and will help to produce better quality of food on the farm. Biosense will establish highly advanced organic chemistry facilities for synthesis and production of insect pheromones.

These are the smells by which the female insect attracts the male for mating. The pheromones are species-specific i.e. they only attract pests that damage the plant, unlike chemical pesticides which also kill beneficial insects. These pheromones will be put into insect traps, fly catcher traps and moth catcher traps that are specially designed, and will be made in India by Biosense.

Pheromone traps can be used to assess insect population on the field so that insecticides are sprayed at the correct time. This avoids wastage and overdose of pesticides and saves costs, labour and time. The second line of production would be protecting plants against fungus diseases. This includes new types of vaccine-like products. The farmer loses when his fruit bearing trees start dying due to fungus infection. These are completely harmless to plants as well as to human beings. These plant protection systems are used in advanced countries and are growing in their usage over chemical pesticides which are feared to leave pesticide residues on foods. The market for crop protection products is huge considering that 186 million hectares is under cultivation in India and the company is confident of achieving full production. Besides, technical collaborators have assured the company of substantial export orders. The company estimates an 80 per cent utilisation of capacity, sales of Rs. 40 crore, net profit, after tax of Rs. 8.08 crore and EPS of Rs. 5.40 per share.

SMALL CHEMICAL MANUFACTURERS HIT BY RAILWAY RESTRICTIONS

The move of the Eastern/South Eastern Railway to stop booking of small consignments of chemicals in goods train since July 1991 and the decision of the Railway Board to stop booking of Acids & Chemicals as defined in the IRCA Red tariff No. 19 Chapter V & VI since 1.7.1981, has hit the small acid and chemical industries of Calcutta hard because acids being dangerous and hazardous are only being carried in small quantities by the Railways.

Prior to 1.7.91 the Indian Railways used to carry the small quantity of acids and alkalis in parcel luggage vans attached to the passenger train but since withdrawal of that facility the only way to despatch the small acid consignments was by goods train only that avenue has also been stopped recently.

According to a press release issued by the Acids & Chemicals Manufacturers Association from Calcutta, the unitary move the Indian Railways has in effect killed the small acid and alkali industries. There are several small tiny acid and alkali processing units spread throughout the country who are processing acids and chemicals, in small quantity, to laboratory grade. These laboratory chemicals in turn, are being used widely in educational and research fields. The association has in a memorandum sent to the Union Minister for Railways, called for steps to amend the situation at the earliest permitting transport of these chemicals by rail.

Lupin assessing possibilities for launch of new drug

Lupin Laboratories is exploring the possibility of introducing mifeprestine, an abortion-inducing drug and an original discovery of Roussel, in the Indian market, reports *The Economic Times*. The drug, in combination with prostoglandins, has been acclaimed as an effective post-coital contraceptive which can supplement a range of preventive contraceptives now available in the market.

Lupin is working on indigenous development of the drug in collaboration with the Indian Institute of Chemical Technology, Hyderabad. The drug has been described as a safe and non-traumatic way of ending a pregnancy. Mr. Sune Bergstrom, a Swedish Nobel laureate and adviser to World Health Organisation who has done extensive studies on the drug, recently visited Lupin in this connection.

"We are only studying the product in the Indian context. We are nowhere near a decision to launch the drug", a company spokesperson said. The Indian Council of Medical Research (ICMR) is independently conducting clinical trials on the drug in select hospitals in the country. Preliminary indications are said to be in favour of introduction of the drug.

It may also be recalled that France has successfully launched an abortion-inducing pill, named RU-486, to be used as an 'morning after' drug. However, for medical and other reasons, numerous countries, including the US have not launched the same product. Some exports believe that the usage of such a drug is not as simple as is made out. The combinations of various drugs which need to be taken, would mean that the medicine is likely to prove effective only when administered by medical professionals. This would greatly limit the usage of the drug, experts believe.

Lupin is more busy launching a range of beta blockers and new generation injectible cephalosporin antibiotics aimed mainly at North American and Chinese markets which should lead to a 60 per cent jump in turnover from over Rs. 300 crores during this fiscal year to over Rs. 500 crores during the next fiscal. The company hopes to exceed a turnover Rs. 1,000 crores in 1994-95.

Lupin is looking at niche markets where there are no more than two to three producers worldwide and the products command a price of $500 to $3,000 per kg. A major facility for producing five injectible cephalosporins will be commissioned in the beginning of 1993. The list of drugs already launched and to be launched within 12 months include cephalosporins like cefotaxime, cefazoline, ceftriaxone, cefradine and cefoperazone; beta blockers like metaprolol and nadelol; quinolones like ciprofloxacin and ofloxacin; analgesics like keto-rolac and antivirals like acyclovir. The Thai subsidiary, Lupin chemicals (Thailand) Ltd., plans to launch AZT (zidovudine), the only internationally used drug in the treatment of AIDS, within three months.

NALCO TO SET UP FACILITY FOR GALLIUM EXTRACTION

A new project for the commercial production of gallium, a vital raw material for the electronics industry, is being cleared by the centre, according to Union electronics secretary **N. Vittal.** The Department of Mines will undertake this project jointly with the UNDP, which will provide assistance worth $2 million, he said while inaugurating the new building of the Anna University's Crystal Growth Centre in Madras.

The facility, to come up at the National Aluminium Company (NALCO) in Orissa, would extract gallium from 'red mud', a by-product in the process of smelting aluminium from bauxite, Mr. Vittal said. He added that the country was blessed in raw materials like gallium which would play a very significant role in its future electronics industry. India had the capacity to produce one-fourth the present world output of 20 tonnes of gallium, and when it did, could export the material, as its domestic annual consumption was only 350 kg, he said.

Anna University's Crystal Growth Centre, recognised by the UGC as an inter-university facility, recently hit the headlines by growing India's first bulk 'indium phosphide single crystal' which finds application in opto-electronics. Mr. Vittal said a proposal whether the new gallium facility could be brought under the umbrella of the Centre for Materials for Electronics Technology (CMET) was being considered. There are at present three CMETs in the country.

Though the Indian electronics manufacturing industry was now using materials based on high purified silicon technology, it was bound to be replaced by 'gallium arsenide' after 10 years, at least in some areas where more speed was needed as also in the area of "photonics", he said.

India's electronics production at $5 billion was only a fraction of the world production of $316 billion, Mr. Vittal said, adding, the former was very import-intensive with 80 per cent of raw material being imported. In the Eighth Plan period, the Centre planned to reduce this big import dependence to 40 per cent, he said.

Congratulating the Crystal Growth Centre (CGC) for its development of key single crystals for application in fast electronics, Mr. Vittal said the DoE had sanctioned a Rs. 50.40-lakh project for the Centre, of which Rs. 34.86 lakh had been released. The CGC's venture was a successful example of what funded research could do, he said.

GSFC ties up technology for citric acid, ACN

Gujarat State Fertilisers Company Ltd. (GSFC) has tied up with Chemie Linz of Austria to set up two joint ventures, one for the manufacture of acrylonitrile and the other for marketing melamine. A third project to manufacture citric acid has also been finalised.

Memorandam of Understánding (MoU) for these projects were signed by GSFC Chairman, **Mr. H.K. Khan** and his Austrian's counterparts during a GSFC team's five-day visit to Germany and Austria.

An MoU has also been signed with Vogul Busch of Austria for setting up a citric acid company in India, a product now virtually monopolised by one Indian company. Yet another MoU has been signed with KFW, the German financial institution, which has agreed to extend sizeable foreign exchange loans for GSFC's expansion projects.

Expansion of melamine capacity

GSFC set up India's only melamine plant with a capacity of 5,000 tonnes in 1976 based on Chemie Linz technology. As melamine demand has considerably increased over the years, GSFC had decided to expand capacity by another 10,000 tonnes for which it had been scouting for technology for the past four years.

Chemie Linz had agreed to supply technology for the expansion project. The present demand was around 10,000 tonnes which would go up to 25,000 tonnes by the time GSFC project was commissioned, according to Mr. Khan.

Buy-back arrangement

Mr. Khan said a major feature of the agreement with Austrian company was that Chemie Linz would buy back 2,000 tonnes a year of melamine for which a marketing joint venture would be set up. The melamine expansion project will cost around Rs. 120 crores and the project will take 36 months for completion. The MoU with Vogul Busch envisaged setting up a Rs. 65 crore plant to produce citric acid using agricultural waste as raw material.

ACN plant from Austria

GSFC, Chemie Linz and a technology supplier will jointly set up a unit to manufacture acrylonitrile, a commodity chemical in extreme shortage in India ever since the only manufacturer, IPCL, started using all its production for captive consumption.

GSFC will purchase a new but existing plant in Austria which was non-operational for want of raw mterial propylene. The 75,000 tonne plant will cost approximately Rs. 200 crores. A new grassroots plant of this size would cost about Rs. 750 crores, Mr. Khan said.

Mr. Khan said GSFC would require foreign exchange to import equipment and machinery for its caprolactam and ammonia plants and it was a measure of confidence in GSFC that KFW has agreed to release 125 million Deutsche Mark loan for this purpose. The loan will start flowing soon after opening a letter of credit, he said.

KRIBHCO's FEAT

The Hazira plant of Krishak Bharti Co-operative Ltd. (KRIBHCO) crossed one crore tonne mark in production of urea recently. This is the first plant in the country to achieve this distinction.

KRIBHCO produced 97.4 per cent of the installed capacity during the first year of operation which was a world record for any similar plant. This went up to 109.7 per cent during 1987-88, to 118 per cent in 1988-89, to 118.3 per cent during 1990-91 and for 1991-92 the capacity utilisation was 117.1 per cent for urea plant.

Hefty hike in fertiliser prices likely

The Union Government has ruled out ne possibility of full decontrol of ferliser prices immediately. Instead, it lans to go in for another hefty fertiliser rice hike by the end of the kharif eason this year.

The Union Finance Ministry has prepared the ground for such an eventuaity, having recently commissioned a tudy by several economists to work out or the first time a possible demand urve for fertiliser consumption. The study will be over and above the findings of a multi-party Parliamentary committee set up to go into the fertiliser pricing aspects. The committee is expected to submit its report by June this year.

Official sources in New Delhi said that the Finance Ministry has ruled out complete decontrol of prices as a viable option in the "next two years". This is expected to scotch speculation to this effect doing the rounds in the industry. Except for decontrol of some more minor fertilisers, partial decontrol of major fertiliser nutrients has also been discounted because it may lead to major pricing anomalies.

The price hike is expected to cover the gap, substantially if not completely, between budgetary allocation and actual outstandings on the fertiliser subsidy front. The total subsidy bill, after taking into account the carry-over of Rs. 1,400 crores from the financial year 1991-92 and an additional outgo of Rs. 500 crore on intermediate imports due to policy changes, is expected to scale the Rs. 7,000-crore mark. Against this the allocation is a mere Rs. 5,000 crore; the gap being a whopping Rs. 2000 crore.

Official sources in New Delhi are keeping their fingers crossed on whether a viable demand curve for fertilisers can be accurately worked out, keeping in view the fact that fertiliser prices have been under an administrative regime for a very long period. Scepticism is also being expressed over whether a multi-party Parliamentary committee can arrive as a consensus about what ought to be done on the fertiliser pricing front.

But the Finance Ministry is expected to go ahead and announce a hike, whatever be the findings of the committee. Both the Finance Ministry and the operational Ministry — Chemicals and Petrochemicals — seem to be of the opinion that the absorption capacity of the Indian farmer is fairly deep and there is unlikely to be a substantial negative impact on demand — to the extent that it will influence foodgrain production adversely. It is guessed that, at the margin, the returns will compensate the higher costs of fertilisers. It will also result in rationalisation of fertiliser use and reduction of wastages.

The Government is obviously preparing the ground for eventual decontrol of fertiliser prices by initiating a series of price increases. But right now, the assumption is that full decontrol will be too much of a shock for the industry as well as to the farmer community. It is estimated that under a decontrolled situation, nitrogenous fertiliser (urea) prices will hover in the band of Rs. 5,000 to Rs. 6,000 per tonne.

While this is expected to come as a boon to the older urea units, with lower capital costs, the new gas-based mega units which are to come up within the next two years will find it difficult to cope. Their average cost of production is expected to be over the Rs. 7000 per tonne mark.

In the long run, it is argued, full decontrol will eliminate the complex retention pricing system which is now is place for the industry. It will wipe out all the so called "fat" that the industry has received reportedly through loopholes within the retention system.

Sulphur, rock phosphate imports come to halt

Sulphur and rock phosphate import has come to a virtual halt after their decanalisation on March 1.

The Department of Fertilisers is yet to issue the notification allowing these imports under open general licence (OGL). Informed sources in Bombay say that the delay in issuing the notification is because the Department of Fertilisers has not yet worked out the pricing norms for both these vital raw materials.

The fertiliser coordination committee which determines the subsidy disbursal to the fertiliser units also has to work out the cost norms for various fertiliser inputs in consultation with the Secretary, Department of Fertilisers.

The issue in finalising the pricing norms is the fluctuating dollar rates in the open market. All importers including Minerals and Metals Trading Corporation (MMTC) have to obtain the foreign exchange from the open market for the import of sulphur and rock phosphate.

Hitherto MMTC was the sole importer of fertiliser and all fertiliser raw materials and fertiliser units have to lift them at prices arrived at by MMTC. By decanalising imports of sulphur and rock phosphate fertiliser companies can also directly import these materials along with MMTC. The sources; however, say that many fertiliser units still opt to buy them from MMTC. Meanwhile, stocks of rock phosphate and sulphur with MMTC have already dried up and nothing is in the pipeline. No fertiliser companies have also contracted any quantities of these materials.

An industry source said that Minerals and Metals Trading Corporation had supplied only 20,000 tonnes of rock phosphate to fertiliser units making single superphosphate (SSP) during last month against a monthly requirement of 70,000 tonnes.

Production of single-superphosphate is, therefore, likely to be lower in the current year as many more SSP units would be forced to close down for want of these vital raw materials. Already, 25 single-superphosphate units, out of a total of 85, have been forced to down their shutters since December last following the abrupt halt of subsidy payments. According to an industry estimate, the total production of phosphatic fertilisers is expected to be only two million tonnes this year as against the projected total consumption of three million tonnes.

Sharp rise in ricebran oil prices

A sharp spurt in ricebran oil prices uring the past three or four weeks is ausing acute concern to the user indus-ries such as toilet soaps/fatty acid and anaspati/refined oil manufacturers. Prices have inexplicably soared by 16 er cent from Rs. 16,900 per tonne on March 31, 1992 to Rs. 19,000 as on ecently last.

The rise in price of this important oil s attributed to the ambiguous descrip-ion of canalised items in the new mport policy. The speculators are thus exploiting the situation by cornering stocks, according to market sources. India produces roughly 4 lakh tonnes of ricebran oil annually, of which about 2.5 akh tonnes is of the edible grade. The mport policy for 1990-93 has canalised 14 items under the head "Fatty Acids/ Acid Oils". Eight of these items (lauric acid, oleic acid, stearic acid, palmitic acid, palm acid oil, other fatty acids —pure or mixed, including acid oils of all types — and soap stock) were decanalised on August 14, 1991 vide notification No. 195 ITC (PN) 90-93.

The remaining six items (palm kernal oil, palm stearine, tallow amines, hydrogenated tallow amines, oleyl amines, and stearyl amines) continued on the canalised list. The new import policy announced on March 31, 1992 continues to retain these six items on the canalised list.

The only difference is that by oversight, the government has omitted to publish the BTN reference numbers under the harmonised tariff as was done in the earlier policy. Quick to exploit the confusion, rumours have begun to float in the oil trade that fatty acids and acid oils have now been recanalised, and this has contributed to the upsurge in price of this key oil. The general trend had been that speculators immediately hoarded all the available stocks and made a situation of artificial scarcity bolstering the prices in the local market. The demand continued to remain steady, mostly from the soap manufacturing units and vanaspati units.

Market sources say that at this critical juncture, when the government is taking various steps to bring down the rate of inflation, the Commerce Ministry ought to clarify the position immediately. If this is not done, the market price of this oil will escalate further, forcing the user industries to raise their prices to end-conumsers.

FICCI POINTS OUT NEGATIVE ASPECTS OF NEW CREDIT POLICY

The Federation of Indian Chambers of Commerce and Industry (FICCI) has pointed out negative points in an otherwise laudable credit policy announced by the Reserve Bank of India. According to the Federation, the credit policy has omitted to include measures to boost industrial growth, which has declined sharply in recent months.

Plastic envelopes edging out paper

Next time the postman delivers you a plastic envelope, it need not be foreign mail. It could well be the annual report of the company whose shares you own. Predictably, Bombay has taken a lead in substituting cloth-lined heavy duty paper envelope with lightweight plastic covers. It is perhaps a sign of the times that financial institutions are ahead of the corporate sector in adopting plastic covers. The names include Bank of America, Canbank Mutual and Bank of India Mutual Fund. Phillips and Klockner Windsor are among the corporate clients.

Mailing covers made of LLDPE (linear low density polyethylene) is a new concept in India developed and promoted by the application promotion group of Indian Petrochemicals Corporation Ltd. (IPCL). There are 15 manufacturers of LLDPE mailing covers in India. "We have now got regular clients (the banks and companies mentioned above) within three months of working on the product," says **Paresh Vakharia** of Supreme Marketix who operates from Bombay.

IPCL's product application centre developed the paper-like film from LLDPE with a rough, writable surface which can take up addressing with ball pens or typewriters. The cover is closed by using an adhesive tape. The most economical method of closing the cover is heat-sealing with hand sealers.

Franking the covers is easy, using a solvent-based ink. Padmanabh Pvt. Ltd. based in Sachin, Surat district, has developed an antiblock and antistatic additive package for processing LLDPE mailing covers.

Plastic covers are lightweight, water resistant, have excellent tear resistance, can be produced in thin gauges with high speed in various forms: transparent, translucent and opaque. A 12 inch X 9 inch mailing cover made from white maplitho paper costs Rs. 1.25 per cover and has a weight of 14 grams. A cloth lined cover of the same size costs Rs. 2.25 and has a weight of 17 grams. An LLDPE cover of the same size costs only 90 paise and weighs 11 grams. And don't forget that lower weight means reduced expenditure on postage.

Foamed and perfumed envelopes are also proving popular, says Vakharia. The greens need not scowl: covers can be recycled. Plastics conserve paper which consumes wood, a dwindling forest resource. He is also experimenting with biodegradable plastic covers.

According to the posts and telegraph department data, 4,850 million private mailing covers of various sizes are in use today. One and a half lakh post offices scattered all over the country handle approximately 70 crores private mailing covers a year.

At an average of four grams per envelope the demand for LLDPE for this application works out to 19,400 tonnes a year, according to IPCL personnel. Other LLDPE applications already in commercial use include bread bags, carrier bags, nursery bags, mulch film, stretch cling film, and multilayer film.

The Nagothane gas cracker of IPCL commissioned its LLDPE/HDPE swing plant on March 31, 1992. The plant is designed to make 80,000 tonnes a year of LLDPE and 55,000 tonnes of HDPE. For the last four years, IPCL has been working on developing the LLDPE market which has risen from scratch to a level of 55,000 tonnes during 1991-92, representing a 69 per cent capacity enabling high plant loading.

STC EXPORTS 5362 TONNES OF RUBBER IN 1991-92

India's State Trading Corporation (STC) exported 5,362 tonnes of rubber in the financial year, ended March 31, 1992, Commerce Minister, **Mr. P. Chidambaram** said in a written reply in Parliament. He said the STC exported the rubber, representing 1.47 per cent of production, in the last quarter of 1991-92. No rubber was exported in the two preceding financial years.

Mr. Chidambaram said India had taken several steps, including financial incentives introduced by India's Rubber Board for planting and replanting, to boost output, which rose to 365,000 tonnes in 1991-92 from 329,615 tonnes in 1990-91.

Mr. Chidambaram said production was also boosted by high-yielding strains, government training, encouragement of community processing and marketing among small holders, and research on cultivation, production and processing of rubber.

He said the southern state of Kerala remained the highest producer, with output rising to 341,500 tonnes from 307,521 in 1990-91, followed by Tamil Nadu, whose output rose to 14,500 from 13,645 while Karnataka's rose to 7,100 from 6,665 tonnes.

VFY MAKERS ASKED TO SUBMIT COST DATA

The Textile Commissioner **Mr. Rajendran Nair** has asked the viscose filament yarn (VFY) manufacturers to submit their cost data justifying the sharp increase in prices effected by them during the past few months.

This follows various representations received by him from weavers from Surat and the south complaining about nearly 250% increase in prices of VFY effected by spinners since June 1987.

A joint meeting to review the situation was convened by the textile commissioner in January 1992 and a follow-up meeting with the representatives of spinners and weavers was held at Bombay on April 24.

Action plan announced to boost exports

The Commerce Minister, **Mr. P. Chidambaram,** announced on April 29th, a five-point action plan to provide a forward thrust to the country's exports in the current fiscal year.

Replying to a debate on the demands for grants of the Ministry in the Lok Sabha, the Minister said the first point is that 34 commodities were identified, for which a national plan for export promotion would be announced in July. The idea is to step up exports of these 34 commodities by 30 per cent in both value and volume terms.

Secondly, the government is to launch a national quality awareness campaign in the third week of May to inject quality consciousness among exporters. Thirdly, the Minister would hold a dialogue with export houses and big industrial houses as most of them are not net foreign exchange earners.

Fourthly, the Commerce Ministry would launch a campaign to revamp external commercial relations and publicity in 40 to 50 countries. Finally, the office of the Chief Controller of Imports and Exports is being revamped and State level export promotion officer is being appointed. The House later passed the demands of the Commerce Ministry by a voice vote. The Commerce Minister said in the year 1991-92, the major development was the trade policy unveiled by the new Government. This is being followed by the five-point action plan in the current year.

Mr. Chidambaram said he proposed to fine-tune the trade policy and only minor changes would be announced and that too only on a quarterly basis. The idea is to maintain the stability and continuity of policy so that exporters were not subject to undue uncertainty. He said that effective from May 1,a simplified procedure for exporters which would be simple, transparent and administratively efficient would come into effect. The Minister said the focus this year is also to step up exports with the seven South Asian Association for Regional Cooperation (SAARC) countries as India has much complementaries and advantages in this emerging powerful trading bloc. He said the idea was to dismantle tariff barriers with these seven countries. The issue would be taken up at the forthcoming SAARC meeting he said.

When Mr. Chidambaram was referring to the need for breaking trade barriers with neighbouring countries, the BJP Member, **Mr. Jaswant Singh,** said even within the country barriers exist in the movement of goods among states. Mr. Chidambaram admitted that the octroi duty was an obnoxious one and must be removed. He asked the members to take up the matter with the Inter-State Council meeting.

The Commerce Minister said this year the export target was not fixed as the 21 per cent savage import curb introduced last year was yet to work itself out. He said despite poor world trade growth, recession in the US, the UK, Japan, France and Italy, India's exports in the general currency area (GCA) in the first eleven months (April-February) 1991-92 registered a 6.86 per cent growth in dollar terms and in volume terms the increase amounted to almost $ 1 billion.

However, trade with rupee payment areas (RPA) suffered a set-back with the collapse of the Soviet Union and the East European market, as exports to these areas were less by Rs. 1,000 crores. On balance, the Minister said, higher exports to GCA and decline in exports to RPA enabled India to post a modest export growth last year in the face of adverse external environment and a general fall in world trade. The Commerce Minister said there exists a crucial nexus between imports and exports and unless we buy we cannot sell more. He said self-sufficiency and import substitution were not sound roads to trade growth. He said the time has come to shed export pessimism. He said a country like China exported $60 billion while India export $18 billion worth of goods. He said in the next four to five years China planned to exports $300 billion whereas India planned to raise exports only to $ 35 billion.

CENTRIFUGAL LATEX EXPORT BEGINS

Centrifugal Latex is being exported from India for the first time, with the Harrisons Malayalam Limited (HML) entering the field exporting 19 tonnes of the commodity to United Kingdom recently.

Mr. A.K. Kuttiah, Executive Director (rubber) of the company said on April 28, that centrifugal latex were one of the purest form of rubber which had great demand abroad. India was fast heading for a heavy surplus of the product, he said. The estimated annual production of centrifugal latex would be around 3,000 million kg against the domestic demand of around 40 million kg. he said. Mr. Kuttiah said HML was considering various downstream projects to manufacture rubber-based products with export potential.

PLEA TO REDUCE DUTY ON FOOTWEAR

The Federation of Delhi Small Industries Associations (FEDSIA) and All India Federation of Plastic Industries (AIFPI) submitted a memorandum to the Government on the need for reducing excise duty on footwear as well as withdrawal of notification number 55/92 dated March 31, withdrawing excise duty exemption to unregistered unit.

As per the press release, a delegation of the federation led by its president, **Mr. M.R. Gupta,** discussed the need for increasing the limit prescribed for excise duty exemption to Rs. 150 per pair due to all-round increase in the input costs.

Vitamin C manufacturers to be investigated by MRTP

The Monopolies and Restrictive Trade Practices Commission (MRTP) has ordered an inquiry into the alleged overcharging and unfair trade practices resorted to by Jayant Vitamins Ltd. and Sarabhai Chemicals Ltd., the only two manufacturers of Vitamin C in the country.

The inquiry follows complaints to the Department of Chemicals by leading formulators of Vitamin C in March that the two manufacturers were charging an amount of Rs. 150 per kg as processing charges. This, they had said, was in addition to the notified price of Rs. 343 per kg. Following the complaints, the Secretary, Department of Chemicals, revised the prices of Vitamin C and all its salts. While that of Vitamin C (plain) was fixed at Rs. 392 per kg as against Rs. 325 earlier, that of Vitamin C (coated) was revised to Rs. 399 per kg from Rs. 333. Sources say that even after the revision, the companies had continued to indulge in overcharging. The formulators have also complained that they have not been receiving supplies despite their having placed orders and made payments in advance.

Both the companies are also likely to come under the scrutiny of the Chemicals Department for the recovery of the overcharged amount as per para 15 of the Drug Price Control Order, 1987. Sources say that shortly after the prices were revised, Sarabhai submitted a fresh cost data seeking a further revision. Since Jayant Vitamins is yet to do so, the department cannot take a decision.

Meanwhile, four leading Vitamin C formulators — Abbott Laboratories, Glaxo Laboratories, Pfizer Ltd. and Roche Products — have asked the government to allow the duty free import of the drug as its availability has become highly irregular. Glaxo has discontinued the production of its Celin tablets while Pfizer has curtailed that of Becosules. The formulators say that they have no way of recovering the excess payment demanded by the manufacturers as the Vitamin C formulations are under price control.

MAJOR REVAMP AT RCF

The fertiliser plants of Rashtriya Chemicals & Fertilisers Ltd. (RCF) at Trombay have set an all-time high monthly production record registering 25,000 MT of ammonium nitrophosphate and 23,000 MT of urea (15:15:15) in April 1992. This is the highest ever production achieved in any April month of the previous years, according to the company.

The company has also achieved its annual turnaround in the shortest possible time and the plants are all set to take on full load for improved performance during the ensuring year, an RCF statement said. The major equipments replaced in various plants include stripper in the Urea-V, hooking of spherodizers in the revamped urea plant, replacing of all the reformer tubes numbering 240 in the Ammonia-V plant at Trombay, catalyst changing in the second stream of Thal Ammonia plant, installation of the repaired stripper in the 3rd stream of the Thal Urea plant, major overhauling of carbon dioxide compressor and putting in new carbamate condenser of better design and material of construction in the urea plant at Thal and modification of process air compressor for the second stream of Thal ammonia plant. All the above challenging jobs have been completed within the scheduled shutdown period. A new indigenous stripper for the first time in the history of Indian fertiliser industry, has been replaced at the Trombay V urea plant under the supervision of RCF engineers. The plant is now operating at the rated capacity.

MRL's aromatic project in 33 months

The industrial activity in Tamil Nadu is all set to get a boost with the clearance of the much-awaited National Aromatics and Petrochemicals Corporation (NAPCO) project by the Cabinet Committee on Economic Affairs (CCEA) recently.

The project, now approved at a revised cost of Rs. 1,725 crores with a foreign exchange component of Rs. 566 crores was earlier approved by Public Investment Board (PIB) in November 1990 at Rs. 1,380 crores with a forex component of Rs. 380 crores. It will have a capacity to produce 2,00,000 tpa of PTA, 30,000 tpa of ortho xylene and benzenes. Expressing happiness over the clearance for the project, **Mr. H. Krishnamurthy,** Chairman of Madras Refineries Ltd. (MRL), and **Mr. A.C. Muthiah,** Vice-Chairman of the joint sector partner, SPIC, said the project will be commissioned in 33 months.

Mr. Krishnamurthy said collaboration arrangement with the American and Japanese companies would be finalised soon. However, he said due consideration will be given to the indigenous technology. Mr. A.C. Muthiah said the technology offered by the collaborators is far ahead of others.

The project is to be funded at a debt equity ratio of 3:1. MRL and SPIC will have 26 per cent each equity in the new project. Mr. Krishnamurthy said the foreign exchange component will be met through NRI investments and suppliers credit. Mitsui, one of the collaborators is taking part in the equity to the extent of 10 per cent.

International financial institutions like IFC, Asian Development Bank (ADB) and Commonwealth Development Corporation (CDC) will also be chipping in with substantial amounts. He said about 25 per cent of the production will be exported, the major markets being the US, Europe and Japan. The total investment on the downstream projects is estimated at Rs. 2,500 crores. Mr. Krishnamurthy said MRL will rope in entrepreneurs for some of these projects.

He anticipates six standard sized plants for producing Polyester Filament Yarn (PFY) and Polyester Staple Fibre (PSF) and one phthalic anhydride plant to come up, besides many units based on benzene as raw material. The land for the project has been acquired and all environmental clearances obtained, he said.

OSWAL AGRO SEEKS APPROVAL FOR LDPE PROJECT IN KOLHAPUR

Oswal Agro Mills Limited, flagship company of the Abhey Oswal group, has quietly sought the approval of the Maharashtra Government for setting up an LDPE manufacturing project at Kolhapur which would be identical to its existing plant at Chembur in the State.

The application assumes significance in view of the reports that **Mr. Abhey Oswal** is planning to reap a Rs. 500 crore bonanza by developing the company's strategically located real estate at the Chembur plant. The setting up of identical manufacturing facilities at Kolhapur would enable the shifting of Chembur plant to the new complex, it is felt. However, Mr. Abhey Oswal seems intent on keeping his game-plan under wraps. When contacted, he admitted that Oswal Agro Mills had moved the application before the Maharashtra Government but denied that the Chembur plant would be shifted 'immediately' to the new site. Mr. Oswal, however, admitted that he planned to develop the surplus 40 acre land at the plant site as soon as the Urban Land Ceiling Act is amended by the Parliament. It is notable that while recently announcing the group's ambitious expansion plans, Mr. Abhey Oswal had chosen to omit mention of the proposed complex at Kolhapur.

CCEA clearance for six petrochem projects

The Cabinet Committee on Eco-mic Affairs (CCEA) has provided the al stamp of approval for setting up six petrochemical complexes in the untry with a total investment of s. 24,000 crores.

The CCEA in a metting on April 28, rovided the final technical sanction for e mega units to come up at Gandhar, aldia, Auraiya, Visakhapatnam, hane-Belapur and Assam.

The projects are being promoted espectively by the public sector Indian etrochemicals Corporation Ltd. IPCL), the Tatas, Gas Authority of ndia Ltd. (GAIL), the U.B. group and National Organic Chemical Inds. Ltd. NOCIL). No promoter has yet been ound for the Assam complex.

Though all these projects were individually sanctioned by the Union governments, the review ordered by the National Front government withheld overall permission. **Mr. V.P. Singh,** former Prime Minister, had called for a review after the Rajiv Gandhi government had sanctioned four crackers — at Auraiya, Viskhapatnam, Thane-Belapur and Gandhar — in rapid succession in September, 1989.

The CCEA has imposed important conditions for the financing of the projects — the units will have to generate their own foreign exchange and they will not be allowed to take recourse to institutional financing.

The two exceptions to these precondtions will be the projects that are to come up in Haldia (West Bengal) and Assam. No budgetary support will be provided for the two public sector projects at Gandhar (IPCL) and Auraiya (GAIL).

All the projects will have a capacity to manufacture four lakh tonnes of ethylene which will yield a host of downstream projects. Each project will require foreign exchange valued at Rs. 700 crores — the total being a whopping Rs. 4,200 crores. The CCEA has made it clear that the promoters can tap foreign corporations, including governments, to finance the projects as co-promoters.

Meanwhile, the CCEA is reported to have discussed ways in which to make the Assam cracker more viable for private sector investment. The Assam State Industrial Development Corporation holds the letter of intent for the project, but it has been finding it difficult to elicit sufficient private sector support because of the disturbed conditions existing in the state. Though concessions have been provided for the cracker, the CCEA felt that additional incentives are also required.

GRASIM LIKELY TO SET UP LAB UNIT AT MANGALORE

Grasim Industries is considering setting up of a linear alkyl benzene (LAB) unit at Mangalore, where the joint sector project, Mangalore Refinery and Petrochemicals Limited, is being set up by the Aditya Birla group of industries and Hindustan Petroleum. Grasim is one of the promoter companies for the refinery. Company sources said that one of the downstream projects which can possibly come up along with the refinery, was LAB, which will be considered after the refinery is set up. The LAB project will have a capacity of around one lakh tonnes. Some of the other down stream projects which may come up include a benzene plant, and a lube oil plant. Grasim was in the race with some other companies for setting a LAB project at Mathura or Vizag.

WNSTREAM TO MANGALORE REFINERY:

aphtha cracker proposal to be revised

angalore Refinery and Petrochemi-s Ltd. (MRPL) which is setting up s. 2,090 crore, three million tonnes annum capacity oil refinery is likely set up a naphtha cracker project in second phase of operations, accord-g to **Mr. Aditya V. Birla**, Chairman, RPL.

Briefing newsmen on the salient fea-es and financial pattern of the refin- project, at Bombay recently, Mr. irla said after completion of the refin-y project the company will exercise e of the three options before it. These ptions are to straightaway double the fining capacity to six million tonnes, et up a lube oil project or go in for a aphtha cracker which will help the ompany enter a string of downstream rojects based on ethylene and propy-ene. Grasim and Hindalco have already pplied for setting up downstream pro-ects.

In fact, the memorandum of under-standing (MoU) between co-promoter Hindustan Petroleum Corporation Ltd. (HPCL) and Indian Rayon Industries Ltd. (IRIL) envisaged the setting up of a petrochemical complex to produce 2.5 lakh tonnes of ethylene per annum.

However, the petrochemicals part of the project was not approved by the Government. With MRPL still keen on the naphtha cracker project as it appears to be the most profitable line out of the three available options, it will be approaching the government for a review of its application, according to Mr. Birla.

MRPL is a joint venture promoted by HPCL and four blue-chip companies of the Aditya Birla group — Grasim, Hindalco, Indo Gulf Fertilisers and IRIL. The company has launched the biggest ever total public issue of Rs. 1,142.66 crores. The issue, made to part finance the grassroot refinery, will open on May 21. The financing plan of the project consists of equity, partly convertible debentures (PCDs), non-convertible debentures (NCDs), foreign currency loans/suppliers credit and leasing/deferred payment arrangements.

The equity of the project will be Rs. 418 crores, out of which 52 per cent will be contributed by the promoters on an equal basis, i.e. 26 per cent each. The remaining 48 per cent will be offered to the public. The project cost of Rs. 2,090 crores also includes a foreign currency component of Rs. 461 crores.

The refinery, located at Mangalore, Karnataka will be equipped to produce annually 77,000 tonnes of LPG, 2.30 lakh tonnes of naphtha, 2.78 lakh tonnes of motor gasoline, 10.40 lakh tonnes of kerosene/ATF, eight lakh tonnes of HSD, one lakh tonnes of bitumen, 0.13 lakh tonnes of sulphur and 2.38 lakh tonnes of fuel oil. The project is expected to go on stream in four years from the zero date, which is expected to be July 1, 1992 when all necessary approvals will be on hand.

The company has enlisted the best available technologies for the project. Its licensors, Universal Oil Products of the US, Shell International of the Netherlands, Kinetics Technology of the US and Engineers India Limited have a reputation for excellence in petroleum technology. The hydrocracker unit will enable MRPL to upgrade the heavy distillates to middle distillates such as kerosene and diesel which are in short supply and are being imported in large quantities. The demand-supply scenario is not likely to change, with demand exceeding supply. According to projection, the country's demand is likely to touch 79.97 million tonnes by 1996-97 against the anticipated refining capacity of 69.4 million tonnes.

B CLEARANCE OBTAINED:

Karnal refinery to cost Rs. 2,700 crore

The Public Investment Board (PIB) as cleared the long-pending proposal or setting up of a new grassroot oil efinery in Karnal in Haryana, The project has been before the PIB for the last ix months.

PIB has understood to have cleared higher project cost of Rs. 2,700 crore with a foreign exchange component of Rs. 300 crore. The project was envisaged to cost about Rs. 1,044.20 crore (March, 1984 prices) when it was first conceived, which increased to Rs. 2,200 crore with a foreign exchange component of Rs. 220 crore when it was cleared by the Ministry of Petroleum.

With the Tatas as partner, the foreign exchange component was expected to be around Rs. 500 crore. The Tatas also insisted on awarding the Soviets the turnkey contract.

The proposal will now be sent to the Cabinet Committee on Economic Affairs (CCEA). The project will be executed by the Indian Oil Corporation (IOC). The PIB clearance is the first government approval after nearly one year when the CCEA had decided to proceed with the implementation of the project without the participation of the Tatas.

On October 11, 1990 the CCEA decision to proceed with the implementation of Karnal refinery project without the participation of Tatas was communicated to IOC.

The IOC then prepared the detailed project report (DPR) and submitted the same with the Ministry of Petroleum and Natural Gas on May 1, 1991 which was cleared by the Ministry in October. The Tatas eventually voluntarily withdrew from the project.

The Karnal refinery is one of the three refineries expected to come up in the Eighth Plan. The other two being the Mangalore refinery and the Assam refinery.

Of these three, only the Mangalore refinery has got full government clearance. The project was originally conceived in 1982 and approved by the government in 1984. The CCEA agreed to set it up in the joint sector on June 12, 1985.

The then CCEA approved Tatas as partners after evaluating various bids on January 5, 1985. A memorandum of understanding between IOC and Tatas was signed two years later on May 22, 1987.

However, the project ran into trouble with the differences surfacing between the two partners over various issues. These included acceptance of Soviet technology, production of petroleum products, induction of termination clause in the MoU, etc.

While, Tata Chemicals' wanted to adopt Soviet technology, advance production of petrochemical feedstocks and no amendment in MoU in regard to including a termination clause, IOC was against these terms.

These issues were sought to be resolved at the highest levels. However, no solution could be found. The core group on economic affairs of the Committee of Secretaries on July 12, 1990 recommended that the IOC should set up the project alone.

According to the project report prepared by Engineers India Ltd. (EIL), the refinery will have a throughput of six million tonnes of crude which would give a range of products including five lakh tonnes of bitumen, 1.2 million tonnes of light distillates (liquefied petroleum gas, naphtha and motor spirit), 3.5 million tonnes of high-speed diesel (HSD), kerosene and aviation turbine fuel (ATF) and eight lakh tonnes heavy distillates. The internal rate of return (IRR) is estimated to be around 19.7 per cent and the project is likely to be commissioned in about 3-4 years after CCEA clearances.

WEST ASIAN FIRM MOOTS PROPOSAL FOR ASSAM CRACKER

The Assam Government is, according to the *Business & Political Observer*, holding discussions with the reprsentatives of a West Asian firm, which has shown interest to be the co-promoter of the Rs. 3,000-crore gas cracker project in the state. The other contender was the Thapar group, which was yet to give its final clearance.

Disclosing this, the Assam Industry Minister **Mr. Bijit Saikia** said that if the West Asian firm agreed to accept the terms and conditions of the state government, the government would prefer to select it as the co-promoter. He said the Dalmia group had also made some inquiries but it later backed out. However, the final agreement with either of the two firms would be signed soon, he added.

Mr. Saikia said that Prime Minister **Mr. P.V. Narasimha Rao,** was likely to visit Assam for laying the foundation stone of the oil refinery at Numaligarh in Upper Assam. The Indo-Burma Petroleum Company, would set up the Rs. 1,800 crore refinery, in collaboration with the Assam government.

The main plant would be brought from Holland through sea and a station, about 11 km from refinery site along the bank of the river Brahmaputra, was being constructed to enable transportation of equipments for the refinery through water. The government was keen to provide financial assistance to the local entrepreneurs, to set up downstream projects the Minister noted.

Environmental clearance for IOC's Gujarat refinery expansion

The Centre has given environmental clearance for the expansion of the Indian Oil Corporation's (IOC) Gujarat Refinery at Baroda. The plan envisages increasing the refinery's capacity from 9.5 million metric tonnes per annum (MMTPA) to 12.5 MMTPA, official sources said.

They said the refinery's additional crude distribution unit got clearance from the Union Environment and Forests Ministry following which IOC will be able to raise the capacity of the refinery's atmospheric distribution unit by three MMTPA. The feed preparation unit and fluid catalytic cracking (FCC) unit and the storage tanks were also sought to be revamped, the sources said.

While clearing the project, the Ministry stipulated that a sulphur recovery unit (SRU) with more than 90 per cent efficiency should be installed and commissioned before the expansion was completed, the sources said. Techno-economic feasibility study for the additional stand-by SRU system might be initiated after the installation of the first unit, they added.

A government order in this connection said maximum recovery of oil from the sludge should be done and oily sludge not be stored in land-fills as was being done at present. The development of a 100-metre wide green belt along the plant boundary was also required to be completed at the earliest. In addition, the development of a 500 metre wide green belt in the down-wind direction should be completed within three years from the date of acquisition of land, the order said.

It said that a detailed risk analysis study based on maximum credible accident extent analysis should be done and submitted to the Ministry once the process design, technology and layout was finalised. Based on this a disaster management plan should also be submitted to the Ministry. The gaseous emissions from various process units should conform to the standards as prescribed by the authorities concerned from time to time.

The order said in the event of failure of any pollution control system adopted by the unit, the respective units should be put out of operation immediately and should not be restarted until the control measures were rectified to achieve the desired efficiency. The company had been asked to set up adequate number of ambient air quality monitoring stations in the down-wind direction.

PIB CLEARANCE FOR BPCL PIPELINE

The Bombay-Manmad pipeline to transport petrol, diesel and kerosene, first proposed by Bharat Petroleum Corporation (BPCL) in 1982, has finally received the green signal from the Public Investment Board (PIB).

Work on the 340 km long pipeline is expected to begin soon and will be commissioned by 1996-97. Though BPCL will be owning the Rs. 228 crore pipeline, two other oil companies Hindustan Petroleum and Indian Oil Corporation too will be using the pipeline to transport their petroleum goods.

All the three oil companies will be setting up storage depots at Manmad to receive the petroleum products sent out of the Bombay refineries of both BPCL and HPCL. The saving to the national exchequer by moving the petroleum products through the pipeline is estimated at Rs. 27.8 crore by 1996-97 and by 2002, around Rs. 38.3 crore. The saving in transportation would be surrendered to the oil pool account.

At present 310 railway tank wagons and 150 tanker lorries are being used per day to transport the petroleum products from Bombay to Manmad. The new pipeline, apart from minimising the transportation cost, would also go a long way in reducing the emission levels in the thickly populated Chembur area, near which the refineries are located.

Moreover, the loss incurred while loading and unloading and also pilferage while transporting by road and rail, which is around Rs. 70 lakh per annum, would be completely avoided once the pipeline goes on stream.

The pipeline project was stalled all these years following pressure from the railways, which anticipated a loss in revenue in the Bombay-Manmad sector. The railways are reported to have relented following the possibility of diverting the existing capacity to the railway network for meeting the oil and non-oil traffic requirements, thereby obviating the need for augmenting capacities.

Railway commuters too will heave a sigh of relief once the pipeline comes through, as the frequent disruption of the suburban railway traffic on the Kurla-Mankurd sector following the movement of goods train from the refineries, will be a thing of the past.

SEEMA INDUSTRIES SETTING UP PLANT FOR POLYESTER RESIN

Seema Industries Ltd. is setting up a unit to manufacture unsaturated polyester resin with an installed capacity of 1,800 tonnes per annum. The unit will be set up at the company's existing location at Bathinda.

The company, engaged in the manufacture of sanitaryware made of cultured marble, proposes to enter the capital market with a public issue of equity shares aggregating Rs. 2.10 crore. The proceeds of the issue will be utilised to part finance the unsaturated polyester resins unit and to buy 150 additional moulds.

Oil reportedly struck near Calcutta

The Oil and Natural Gas Commission (ONGC) has struck oil at Ichhapore in Nadia District, about 100 km from Calcutta. ONGC officials are yet to confirm the find. But the INTUC-affiliated ONGC Employees Association, in a statement issued at Calcutta said light variety of "sahara" crude was gushing out of the well from a depth of 4346 metres.

The association demanded immediate release of more drilling points in that particular area long with the Sunderbans and other areas in West Bengal. Also, more rigs should be deployed for undertaking drilling in shallow waters.

Presenting the samples of crude drilled at Ichhapore, **Mr. Chittabrata Majumder,** General Secretary, West Bengal Committee of Centre of Indian Trade Union, regretted that although oil was struck as early as in April 19, the Central government and the ONGC authorities preferred to keep silent on the discovery. This was for the first time that crude was really flowing out of a well in West Bengal, yet there was no official announcement, he said.

Mr. Majumder urged the ONGC authorities to come out with a statement on the status of oil exploration in the state, particularly on the finding at Icchapore, and step up drilling activities in view of the latest discovery of reserves of hydrocarbons.

Drilling at Icchapore near Chakdaha in Nadia district began in November 1990 with a rig built by Bharat Heavy Electricals Limited. The target for drilling was set at 6,000 metres. But the oil has been struck at a depth ranging from 4346 metres to 4349 metres. The flow of oil is understood to be intermittent and not very regular.

According to drilling experts, it may be a month or so before the commercial viability of a well with trace of oil could be conclusively proved. The oil at Ichhapore might have been discovered as a result of "drill stem" testing but the actual size of the reserve can be known only after production testing covering "bottom hole" studies and other advanced testing has been completed.

As long as production testing goes on, drilling operation will have to be suspended. The experts also feel that even if the present well with trace of oil is found commercially unviable, ONGC might consider drilling a few more wells in the vicinity. This is because gas could be struck at different layers. It remains to be seen what follow-up action ONGC decides to take in view of the discovery of oil at Ichhapore.

DRILLING ABANDONED AT QUILON I LOCATION

The petroleum exploration programme of the Oil and Natural Gas Commission (ONGC) suffered another setback on April 21, when the offshore, rig owned by Essar got stuck after drilling a little over 300 metres in Bombay offshore. The drilling ship *Essar Discoverer* was deployed in Quilon-I location.

According to geological estimates made by ONGC, the field has a potential of over two million tonnes of petroleum crude. The exploratory drilling in Quilon first ran into rough weather about six weeks ago when *Discoverer* got stuck at an earlier location after drilling beyond a depth of about 500 metres. ONGC had marked another location for the drilling ship hopeful of locating hydrocarbon reserves before the monsoon disturbances obstruct drilling in offshore locations.

Both the wells have been abandoned for the time being. The accident has put the ball back in the courts of ONGC which will have to decide about deploying either *Discoverer* or any other drill ship in the area. Considering the paucity of drilling ships with ONGC, there may be a possibility of redeployment of the Essar ship to prevent further slippage on exploration.

The commission is already struggling to put its exploration and production programme in line with the targets which have suffered because of the delay in taking certain policy decisions by the government.

The industry associations have also openly cautioned the government about the delay in charter hiring of Indian rigs and its consequences on the overall oil exploration.

The indecision regarding the charter hire has rendered five rigs, all Indian assets idle. The rigs include two which are owned by the Shipping Corporation of India.

According to reports, ONGC has recommended hiring of the rigs but the government has asked the commission to first draw a policy outline on charter hire. And so far as the policy is not in place it has been advised to go in for charter hire on rupee payment terms.

NATH PULP's SODA RECOVERY PLANT BY YEAR-END

Nath Pulp and Paper Mills proposes to set up a Rs. 16-crore soda recovery plant. Till now, soda recovery plants have been installed only for paper plants based on wood pulp as raw material.

The soda recovery plant will have a capacity to handle 125 tonnes black liquor solids per day corresponding to 90 tonnes of bagasse pulp per day. The recovery efficiency for chemicals is over 85 per cent.

The recovery plant will have its own electrostatic precipitator for air pollution control. The plant is expected to be commissioned by the end of the year.

6 more tankers needed for oil imports

India will need to acquire six additional tankers to meet the country's requirement of crude imports during the Eighth Five Year Plan till 1995, according to the Union Ministry of Surface Transport.

The Tonnage Acquisition Committee (TAC) of the Ministry in its review meeting recently made a tentative reassessment of additional tanker tonnage and proposed the acquisition of six additional Suezmax tankers (1,40,000 dwt each) owing to increased import requirement of crude oil. The additional requirement is projected to be around 27 million tonnes (mt) for 1992-93 and around 23 mt for 1993-94.

This assessment has been made after taking into account the two crude oil tankers being acquired by Essar Shipping. The committee has also made a tentative proposal to create 5-10 per cent additional capacity for likely spot market purchase in future. Hitherto, most of the spot purchase delivery contracts have been clinched by foreign owners.

A sub-committee has been constituted to study the reassessed proposal and present a detailed proposal. The committee is expected to make a final proposal to the ministry for approval shortly. Also, the movement of domestic crude is yet to be ascertained as the representative of the Oil and Natural Gas Commission was not present at the meeting.

TAC in its earlier meeting had proposed replacement of seven overseas tankers and three ore bulk oil carriers (OBOs) during the Eighth Five Year Plan based on annual import requirement of 18 mt. The Committee, at that time, did not propose any additional acquisition of tonnage. However, the revised estimate of import crude is around seven mt more, necessitated by reduction in domestic production in the Bombay High by 1.3 mt and other reasons.Moreover, there is also increased demand for crude in order to enhance the domestic refining capacity. According to TAC's projections, the domestic production is likely to be 15.87 mt in 1992-93, 17.07 mt in 1993-94 and 18.8 mt in 1994-95.

Once the ministry approves the proposal, the controversy regarding private sector entry into acquisition of tankers, which has so far been the domain of the public sector, will end. It is learnt that the public sector Shipping Corporation of India (SCI) is not in favour of private sector participation in crude oil carriage.

SCI is confident of meeting the entire additional tonnage requirement. According to reliable sources, SCI has already entered into negotiations for purchases of six tankers which will be delivered by the end of the current year. It is learnt that in the past 15 months, 52 foreign tankers have been chartered for carriage of import of crude oil, most of which were spot purchases owing to virtually no import from the main suppliers viz., Russia, Kuwait and Iraq in the previous year due to political reasons.

India's current tanker fleet is as follows: Two coastal tankers of 41,120 dwt each owned by SCI, 23 overseas crude tankers of which Ratnakar Shipping owns a 60,700 tonne vessel. The rest belong to SCI (two 2,76,652 dwt vessels, two 1,50,700 dwt vessels, two 1,15,700 dwt vessels and remaining vessels range between 67,000 dwt and 85,000 dwt).

The country's tonnage also includes nine OBOs of which four belong to SCI, three to Great Eastern Shipping Co., one to Essar Shipping and one to SCICI. Recently, Essar Shipping has acquired two Suezmax tankers which are yet to be delivered.

CIL may earn Rs. 100 crore profit in '91-92

The Coal India Ltd. (CIL) may register a profit of Rs. 100 crore in 1991-92 as against a loss of Rs. 253 crore in the previous year. This was stated by the Minister of State for Coal **Mr. P.A. Sangma,** while inaugurating a seminar on investment in the coal sector, organised by the Bureau of Industrial Costs and Prices (BICP) in New Delhi.

The gross margin or profit before interest and depreciation has gone up by Rs. 550 crore to Rs. 1,350 crore in 1991-92. Sales have gone up by Rs. 1,100 crore in the second half of 1991-92 as against a decline of Rs. 108 crore in the first half when compared with a corresponding period in the previous year.

The Minister attributed this turnaround to quicker realisation of money from customers under the cash-and-carry scheme introduced since October one, 1991, which has upped realisation by 33 per cent. There has been a sharp cut in capital expenditure to the tune of around Rs. 600 crore without any perceptible impact on production.

There has also been an improvement in financial discipline within CIL as a result of the interaction between CIL management and workers, and the ministry. The monthly reviews of CIL's performance should yield encouraging results in this fiscal year, the minister felt. The minister also urged customers to undertake joint sampling of coal at the pitheads and be satisfied about the quality of the coal being supplied by CIL.

Sale on credit ruled out

Mr. Siddu Nyamagouda, Union Deputy Minister of State for Coal, has firmly ruled out the possibility of reverting back to sale of coal on credit basis.

Speaking to journalists at Hubli on April 23, he said that although there was pressure from some quarters to reconsider the decision of the ministry of coal to carry on sale of coal on cash-and-carry basis, the stand would not be changed. According to him, the cash-and-carry system, introduced only in November, 1991, had been yielding good results, with the turnover being Rs. 450 crore every month.

Mr. Nyamagouda disclosed that the CIL had approached the World Bank for financial assistance to the extent of Rs. 2,000 crore for the purpose of developing coal resources during the Eighth Five Year Plan. The financial assistance, in the form of a loan, was expected to be finalised by the end of the year, he added.

He said that the Coal India was concentrating on increasing the coal production to meet increasing demand and had not given thought to the proposal of the railway's 'Own your wagon scheme''. He admitted that Coal India needed about 16,000 wagons every day to move coal.

At present nearly 15,000 wagons were pressed into service and yet stock of coal to the extent of 45 million tons was lying idle. However, he added, the ministry had been considering the scheme. He also ruled out any move to privatise the coal fields.

SECL OUTPUT EXCEEDS TARGET

The South Eastern Coalfields Ltd. (SECL), which achieved a growth rate of more than 12 per cent during 1991-92, has earned a gross profit of approximately Rs. 385 crores.

The company, a subsidiary of Coal India Ltd. (CIL), has produced 64.8 million tonnes during 1991-92 against the target of 62.6 million tonnes. It produced 58.08 million tonnes during 1990-91. According to the SECL Chairman-cum-Managing Director, **Mr. U. Kumar,** the company had been split and a new company — Mahanadi Coalfields (MCL) with the coalfields located in Orissa had come into being from April 1. As a result of this, the production target of SECL had been fixed at 44.87 million tonnes (mt) and MCL at 24 mt for the current financial year.

Referring to the Orissa coalfields, he said the Orissa coal reserve was the second largest after Bihar in the country but extractable coal in Orissa was more than Bihar. Mr. Kumar said by the turn of the century, MCL could produce 60 million tonnes annually due to this factor. The Orissa coalfields area was a profitable one as the growth of production was easy, and there was much less problem there. The bifurcation process of MCL was complete now, he added.

Referring to SECL, for maintaining its profitability, the company was laying stress on production from underground mines. For this, he said coal loading operation was being upgraded and mechanised in underground coal mines and the transport system rationalised and improved. In addition, one new coalfield, namely Mand-Raigarh located in Raigarh district of Madhya Pradesh, was going to be opened. The company would be intensifying its efforts for exploiting this coal field.

CIL TO SUPPLY 11.6 MILLION TONNES COAL TO STEEL SECTOR

Coal India Ltd. (CIL) plans to supply 11.6 million tonnes of coal to the steel sector in the current financial year. This was decided at a coordination committee meeting held by the Coal and Steel Ministry officials recently.

In 1991-92, CIL supplied 9.85 million tonnes of coking coal to the steel plants, both from direct fields at Dhanbad and its washeries. CIL's production fo. 1991-92 is 0.69 million tonnes higher than last year's 9.15 million tonne. At the international average price of $70 per tonne the foreign exchange saved is about $45 million.

BAN ON EXPORTS:

Large quantities of iron ore may be unutilised

Stoppage of iron ore exports could prove disastrous not only for the mining industry but also for the nation says a report in *The Financial Express.*

Prompted by the controversy created by the statement of the Prime Minister in Lok Sabha recently that no fresh contracts would be made for export of high-grade iron ore the industry has conducted a study which reveals that against the total production capacity of 70 million tonnes, the country is producing only 55 million tonnes per annum. And out of the total production of 55 million tonnes as much as 32 million tonnes are exported and only 22 million tonnes are consumed in the domestic plants.

If the export of iron ore is blocked all of a sudden, the country will not have the means to take care of its surplus iron ore even of the high quality. Similarly, the iron ore from Goa, Redi (Maharashtra), and Karnataka cannot be domestically consumed either because of low grade of ore or because of long haulage unless new steel plants are set up in those areas involving huge imports of coking coal and other flux material.

Even if the government is very keen on not exporting iron ore, it will take quite some time, apart from huge amount of money to utilise the quantities currently being exported. After the bitter experience of Visakhapatnam Steel Plant, the cost of which has gone up by four times, the government does not plan to set up any other integrated plant in the public sector. The private sector too is hesitant in investing the amount needed for setting up steel plants.

The absence of infrastructure and other linkages may deter the foreign companies to invest in the capital intensive steel sector. It has been pointed out that the iron and steel has been delicensed but necessary follow-up action like dereservation of steel-input mineral bearing areas has not taken place. There is also lack if adequate facilities available to handle volume of traffic for minerals as well as for the finished products.

The steel production, therefore, may not come up to the required or projected level. Which would mean that the rate of growth of utilisation of iron ore would remain rather slow. India's reserves were estimated by Indian Bureau of Mines (IBM) in 1985 at 10,267 million tonnes of hematite and 1,709 million tonnes of magnetite thus making a total of 11,976 million tonnes.

The reserves are likely to go up with more and more exploration but our capacity to convert iron ore into value-added steel shall continue to remain limited. The stoppage of exports will adversely hit the iron ore industry located in backward tribal areas providing direct employment to 50,000 workers and indirectly to about 1.5 lakh workers. In some States like Goa, iron ore mining is the backbone of the economy.

The non-captive mines in Goa, Redi, Karnataka, Bihar and Orissa depend upon exports. Any reduction in exports will proportionately scale down the production leading to unemployment apart from hitting the inflow of foreign currency. However, as far as the world steel industry is concerned, India's retreat from the market which is easy to achieve, will not make a difference. It has been estimated that there is a surplus production capacity to the tune of 50 million tonnes of iron ore in the world and any stoppage of exports from India will benefit other exporting countries.

NMDC to form subsidiary to develop Bailadilla mines

National Mineral Development Corporation (NMDC) is to float a new subsidiary company to develop mine 11-B in Bailadilla. The decision to float a subsidiary follows as talks have failed with private sector companies who had been approached for possible participation as joint venture partners with NMDC.

NMDC has commissioned SBI Capital Markets Limited to prepare a detailed proposal for formation of a subsidiary. NMDC will hold 51 per cent shares in the proposed subsidiary and the balance portion of the equity will be invited from the public. Ores from mine 11-B is to be used for the manufacturing of sponge iron. Demand for high grade ores is going to rise as a number of sponge iron units are coming up. These units plan to use ores from the Bailadilla as their main feedstock.

According to **Mr. P.C. Gupta,** Chairman and Managing Director of NMDC, the corporation required Rs. 600 crore to develop new mines to increase its ore production to meet the demands in the Eighth Five Year Plan.

He said that SBI Cap. is to advise the corporation as to what should be the capital structure of the company and how to raise the balance requirements of funds.

Mr. Gupta also said that he had suggested to the government that 10 per cent of its equity should be disinvested. He stated that employees of NMDC would be given the option to own a small part of the corporation's equity. He said that he expected a good premium on the shares as the performance had been very good and earning per share was also good. NMDC expected a profit of Rs. 125 crore on a paid up capital of Rs. 135 crore for the year ended March 1992. Mr. Gupta said that final position would be known on finalisation of the annual accounts.

Pig iron plant in Bastar

NMDC will also set up a pig iron plant in the Bastar region to satisfy the aspiration of the local population, Mr. Gupta informed. He said that dissatisfaction was brewing in the Bastar region as the local population felt that raw materials were being taken away whereas the region remained underdeveloped. The proposed plant would cost Rs. 50 crore.

Mr. Gupta also stated that NMDC planned to give a special rebate in the iron ore price of Rs. 10 per tonne to those entrepreneurs who would put up a plant in Bastar region. He, however, lamented the fact that infrastructural facilities were very poor in the region discouraging investment there.

In view of the government's decision not to give any budgetary support for new projects, steel ministry had advised NMDC to explore the possibility of private sector participation for development of new mines. Essar, Nippon Denro, Grasim and a few other groups had evinced interest in the project. But they were averse to the idea of forming a joint venture with NMDC.

ORDE INDUSTRIES TO PRODUCE CARBON FERRO MANGANESE

Orde Industries Ltd., is expanding and diversifying its existing Malanpur plant, 20 km from Gwalior, to produce high-quality carbon ferro manganese that goes into the manufacture of steel.

The ferro alloy industry is out from the purview of licensing thanks to the government's new liberalisation policy. So the company decided to make the plunge for expanding its furnace capacity from 4.5 mva to 7.5 mva to switch over from ferro silicon to high carbon ferro manganese thereby increasing the annual production capacity from 3,600 mt to 15,000 mt. The company has already made success in ferro silicon in a short span of two years.

For 1990-91, company had paid 12 per cent dividend. An interim dividend of nine per cent has already been declared in 1991-92. The site development, construction of building and fabrication of plant and machinery are going on side by side with full speed to make it ready by April end. The construction of building and fabrication will be completed by the end of April and the trial production will commence before the end of May. High carbon ferro manganese is required for manufacture of steel and hence it can be rightly described as spice for the steel industry in common man's parlance.

The directors expect the new product, ferro manganese, will give better profit margin than the present ferro silicon. They also have no hesitation to give out the trade secret that the cost of production of ferro silicon is governed by power, whereas in case of ferro manganese the power consumption is down to 35 per cent. They know the power cost is bound to shoot up in the changed economic policy of the government and hence the switch-over to the new product. "We will improve our profitability, through the proposed switch over and at the same time be making our humble contribution towards the government's save electricity campaign", said company Managing Director, **Mr. R.P. Mittal.** The Rs. 5.18 crore expansion-cum-diversification envisages production of 12,000 mt of high carbon ferro manganese at 80% of capacity utilisation in the third year of production worth Rs. 16.8 crore at current prices to give a minimum return of 29% on the capital employed. The company is coming with public issue of Rs. 355.86 lakh shortly. The company has already got approval for said issue from the Controller of Capital Issues (CCI).

Usha's pig iron project to cost Rs. 96 crore

Usha Ispat Ltd. is setting up a foundry to manufacture 1.89 lakh tonnes of pig iron at Redi, Sindhudurg, Maharashtra which is expected to be completed by July and will add Rs. 124 crore to the company's turnover.

Usha Ispat has entered into an agreement with Metallurgical and Engineering Consultants (India) Ltd. (MECON) for detailed engineering. MECON will be assisted by Mannesman Demag Germany. Limestone, a raw material, will be sourced from Bagalkot, Karnataka, and Yeotmal, Maharashtra. Dolomite, another input, would be supplied from Yeotmal or Bagalkot. Manganese ore needs are to be met from Manganese Ore India Ltd.

Coke for the plant is to be imported either through from Goa or Vengurla, Redi. Quartzite is to be obtained from deposits that are in the vicinity. Western India Coalfields Ltd. will supply coal to Usha Ispat. The blast furnace process that has been perfected by Mannesman Demag is to be installed for the production of pig iron. Two blast furnaces of the welded shell construction, self-supporting type, equipped with connectional two bell top charging system, eight Tuyers, one-iron notch and a slag notch are going to be utilised.

Tuyers will supply the hot blast, that will melt the solid burden charged from the top liquid metal and hot metal will be collected from the hearth. The hot metal will be tapped through iron notch into ladle and slag through notch. Usha Ispat has acquired 93 acres of land for the project. ECC Group of L&T, has been contracted to execute civil works of the project and a major percentage of these are complete.

The sub-group of the working group for the iron and steel industry has forecast that domestic production of pig iron will fall short of supply by 13,00,000 tonnes in 1994-95 and 30,00,000 tonnes in 1999-2000. The main purchasers of pig iron, produced by Usha Ispat, will be users from Sholapur and Kolhapur (50 per cent) in Maharashtra and Coimbatore (30 to 35 per cent) in Tamil Nadu and Gujarat.

Usha Ispat will be the first pig iron project in Maharashtra and will be financed by a public issue of Rs. 10.52 crore of Rs. 10 shares at par. Secured partly convertible debentures of Rs. 35 crore will be privately placed with GIC, UTI and LIC to raise funds for the project. The IDBI or IFCI are lending Rs. 24 crore to Usha Ispat Ltd. for the new unit. Usha Rectifier Ltd. and associate companies will contribute Rs. 27 crore to fund the Redi plant. Of the total project cost of Rs. 96.52 crore, land and site will cost Rs. 2.78 crore, building Rs. 12.92 crore, plant and machinery Rs. 62.33 crore, knowhow and engineering fees Rs. 4.97 crore, preliminary and pre-operative expenses are Rs. 10.68 crore and margin money for working capital is Rs. 2.84 crore.

French technology tied-up for mining exploration

The Geological Survey of India (GSI) has signed three agreements with BRGM of France for Intensive exploration of copper, lead and zinc in Rajasthan, gold in Kolar Schist belt in Karnataka and multi metal exploration in the green belt of the South.

Addressing the meeting of the Consultative Committee attached to his Ministry in New Delhi on April 23, the Minister of State for Mines, **Mr. Balram Singh Yadav,** said gold, platinum, diamond, tin, cobalt, potash and rare earth minerals would form the thrust areas for exploration by GSI during the Eighth Plan period.

The Ministry has also taken up modernisation of GSI during the Eighth Plan and the country would import foreign technology wherever necessary. Mr. Yadav informed the members that the total value of minerals produced, excluding fuels, minor minerals and atomic minerals, was Rs. 1,769 crores in 1991-92 compared to Rs. 1,599 crores in the previous year registering a growth of 11 per cent.

The government had approved the disinvestment of 20 per cent of the equity in the Hindustan Zinc Ltd., and 2.72 per cent equity in the National Aluminium Company. The shares of these companies have been listed in the major stock exchanges.

The integrated lead-zinc smelter project at Chanderiya in Rajasthan, which was commissioned on time, has produced at 105 per cent of its rated capacity in March 1992. The production of lead by HZL during 1991-92 was 31,683 tonnes against the production of 23,000 tonnes in the previous year representing an increase of 38 per cent. The production of zinc by HZL increased from 65,013 tonnes in 1990-91 to 85,509 tonnes in 1991-92 indicating a growth of 31 per cent.

The level of self-sufficiency in the case of lead has increased from 54 per cent to 65 per cent in 1991-92. In the case of zinc, the level of self-sufficiency has increased from 64 per cent to 80 per cent in 1991-92. The production of refined copper during 1991-92 was 45,495 tonnes as against 40,598 tonnes in the preceding year.

He said that the Ministry has revised the rates of royalty on minerals other than coal, lignite, sand for stowing and minor minerals with effect from February 7, 1992. The revised rates, would compensate the States for the loss of revenue on account of Supreme Court judgement striking down levies and cesses on minerals collected by State Government.

Tamil Nadu survey assesses source of pollution of coastal waters

The main sources of pollution along the Tamil Nadu coast are disposal of sewage and industrial waste, surface run-off from contaminated rivers and thermal discharges from cooling waters of power plants.

Deposition of air pollutants and oil spillages from tankers, tanker washing and on-shore and off-shore oil exploration activities are some other sources.

This has been highlighted in a survey conducted between Ennore to Kanyakumari coastline of Tamil Nadu covering 34 sampling waters and seven off-shore waters stations. The survey was contained in a paper on " Marine pollution studies in the coastline of Tamil Nadu" presented at a seminar on marine pollution held at New Delhi recently.

The nature of pollutants generated from the industries are bromine, chlorine, urea, fluorine and domestic sewage which get discharged into this region the paper said. The release of heated water generated from thermal and nuclear power plants located at Ennore, Kalpakkam and Tuticorin causes stress on floral and faunal components, inhabiting the discharge points, which gradually replaces, certain species of sessile, corals, marine algae and sea grass, except those eurythermic in nature, the paper said.

A sharp decline in oxygen level in inland and coastal waters was observed at Sahupuram located between Tuticorin and Kanyakumari stretch, according to the paper. The survey revealed that horizontal distribution pattern of oxygen decreases from inland to offshore of Tamil Nadu coast.

Most of the floral and faunal components in the inland, coastal and off-shore waters are adopted to a constant salinity with a narrow range in its concentration. The average values of inland, coastal and off-shore waters of Tamil Nadu coast showed an increasing trend of salinity and this could be due to the fact that areas of adjacent land mass near inland waters often have low salinity due to dilution from terrestrial run-off, the paper said.

Occasional high salinity values were recorded in the shallow inland and coastal waters at Sahupuram due to high rate of evaporation and mixing of local waters containing concentrated dissolved salts, according to the survey.

The peak levels of nitrate, ammoniacal nitrogen and total nitrogen are associated with north-east and south-west monsoon rains, the survey revealed.

Higher values of nitrate and ammonical nitrogen and total nitrogen were recorded in inland and coastal waters between Ennore and Madras region which are highly influenced by the continuous discharge of Madras city sewage and industrial waste through Adyar and Cooum rivers, it said.

The overall analysis of the data reveals that there is a longitudinal dispersion of pollutants, and the higher concentration of nutrients distribution in surface, and mid-depth water, on most of the occasions, lead to a conclusion that the input of pollution load in coastal Tamil Nadu is within the assimilation level.

SSI'S TARGETED FOR POLLUTION ABATEMENT

The Environment Ministry has identified seven 'priority areas' for abatement of pollution in the country. This was stated by the Union Environment and Forests Minister, **Mr. Kamal Nath,** while presiding over a meeting of the Parliamentary Consultative Committee of his Ministry.

Mr. Kamal Nath identified the seven priority areas as: small-scale industries, standards, sectoral integration, fiscal measures, environmental audit, environmental statistics and public participation.

The recently promulgated national policy for the abatement of pollution specifies that the objective is prevention of pollution through adoption of low or no waste technologies and to assist endeavours which would make pollution prevention economically viable.

Mr. Kamal Nath said, the national policy sought to harmonise abatement of pollution with economic development. To achieve this, he said, environmental aspects would be considered in industrial and other activities such as river valley projects and to give financial incentives for pollution control.

The Minister regretted the reluctance, both in the private and public sectors, to allocate funds for pollution control. He said environmentally sound technological innovations were also not integrated into industrial production and scientific engineering research institutions were not adequately advancing techniques and methodologies for abatement of pollution.

Participating in the discussions **Prof. M.G.K. Menon** stressed the need for a vast monitoring network for pollution control and to assess damage due to uncontrolled use of pesticides and insecticides. **Mr. Chandresh Patel** drew the attention of the Minister to the problem of increasing salinity in the Saurashtra area of Gujarat.

Mr. Sukhemdu Khan laid stress on community participation, both in pollution control and afforestation efforts.

AIMO urges steps to boost SSI sector

The All India Manufacturers' Organisation (AIMO) has urged the Union Government to set up a separate mutual fund for the small scale sector. The initial size of the fund could be around Rs. 1,000 crore which could subsequently grow. The AIMO has also called for a separate listing for the SSI in the stock exchanges with the help of the Securities Exchange Bureau of India (SEBI).

According to AIMO President, **Mr. Vijay Kalantri,** with adequate finances and support, the small sector could add an estimated ten per cent to its export turnover this year. He told newspersons in Madras on April 24, that even as the government was bringing about a sea-change in its industrial and trade policies, it needed to decide on the exit policy soon.

While the organisation was indeed against total retrenchment of staff under the exit policy, it was imperative to bring about some structural readjustment. Similarly, he said, the Union Government would do well to extend the National Renewal Fund scheme to the private sector as well instead of confining it to the state undertakings.

The AIMO chief felt that the private sector could easily raise an estimated Rs. 25 crore under the renewable fund including the contribution of the employees, who could provide rupee one per month or so. This corpus of Rs. 25 crore would go a long way in bringing about the much needed restructuring in the country's labour policies.

Likewise, the AIMO wants certain banks and their branches to be identified for dealing exclusively with the small sector. Mr. Kalantri also referred to the possibility of signing a memorandum of understanding with Russia and even Israel for that matter, for promoting trade. The likelihood of an AIMO delegation visiting these countries soon was not ruled out.

The other suggestions for boosting exports and raising overall production and curbing inflation, included incentive to manufacturers who exceed their production over a three year period.

The incentive should be on the excess production. Similarly, the AIMO called for automatic registration for SSI, introduction of the proposed legislation on prompt payment to the small sector, removal of the turnover limit for this sector and, more important, the imperative of raising the exemption limit for excise for the small sector. All these measures, Mr. Kalantri explained had been highlighted from time to time in a host of memoranda submitted to the government. It was hoped that the government would act fast.

INDUSTRIALISATION SCHEME FOR KERALA AWAITS CLEARANCE

The Kerala Industrial and Technical Consultancy Organisation (KITCO), a wing of the Industrial Development Bank of India (IDBI), is awaiting clearance for an intensive industrialisation scheme envisaging setting up of 500 small scale units in the State. The IDBI Executive Director **Mr. K.U. Mada,** who is also Chairman of KITCO said that the proposal was being actively considered by the State Industries Department.

The proposal envisages KITCO's active association with the units from the planning to the marketing stage. The idea is to set up the units in two years. Lack of proper advice during various stages was the main reason for many industrial units becoming sick in the State, according to Mr. Mada.

KITCO's association in the schemes would be financially compensated by entrepreneurs, government and financial institutions, Mr. Mada said.

Bulk users may operate captive coal mines

The Union Government, according to *The Economic Times*, plans to throw open coal mines to all private units for captive consumption. The Union Coal Ministry has moved a note for consideration of the Cabinet Committee on Economic Affairs (CCEA) to this effect. Bulk private consumers of coal like power complexes, steel units and cement plants will be allowed permission to operate their own coal mines by the Central Government.

Amendments to the Nationalisation Act of 1973 will be carried out to allow creation of private coal mines. The Act was once amended in 1976 allowing usage of coal mines by state government undertakings.

Private coal mining activities will, however, be subjected to strict scrutiny by the Coal Ministry. Adequate checks will be imposed to rule out the possibility of over production and leakages of coal into the highly lucrative open markets. This precaution has become necessary because for some private units, exploitation of coal may become a more attractive proposal than their main activity.

Also to be elaborated will be the modalities to be followed if a single mine caters to two or more private projects manned by different managements. In these cases, the distribution policy may also be dictated by the Union Coal Ministry.

The private units will have to identify the unutilised mining areas. Subsequently, leasing rights will be granted by the government. Official sources at New Delhi said that the captive mines will also be allowed permission to set up coal washeries to improve the quality of coal. The bulk of the demand for private mines are expected to come from coal energy intensive projects in the power, sponge iron, steel and cement sectors. Units which are not energy intensive will not require private mines, especially as such mines will not be allowed to be exploited for outside sale.

Sources said that the Coal Ministry has already accorded sanction, in principle, to the proposal for a private mine connected with the Budge-Budge project being set up by the R.P. Goenka group. The follow-up action will now have to be taken by the Union Power Ministry on the proposal.

The Coal Ministry's initiative for throwing coal mines open to the private sector has arisen because of growing criticism that the consumption needs of some of the bulk consumers, like power and steel, are not being adequately met by Coal India Ltd. (CIL). The power ministry has consistently claimed that short supplies by CIL has been one of the reasons behind inadequate power generation.

Panel raps Coal India functioning

The Parliamentary committee on public undertakings (COPU) has criticised the functioning of the Coal India Limited (CIL) and its subsidiaries which incurred a cumulative loss of Rs. 2,500 crores against investment of Rs. 9,000 crores.

The COPU in its seventh report observed that due to heavy losses, the CIL has been unable to repay loans and interest to the government and at the end of March 1990 over Rs. 1,000 crores was due to be paid to the government.

The committee also noted that the coal companies are experiencing difficulties in collecting dues from its main consumer sectors viz. power houses, steel plants and railways and the total outstandings of CIL as a whole stood at Rs. 2,163.75 crores at the end of March 1990.

An amount of Rs. 1,876 crores was due from power sector alone accounting for about 88 per cent of total dues, the committee noted and asked the government to provide all necessary help to coal companies in timely recovery of their dues from various sectors particularly the state electricity boards.

The COPU suggested that appropriate rate of interest should be charged from the defaulters. The COPU in its report, presented in both the houses of Parliament on April 28, said the CIL has attributed its sorry state of affairs due to inadequacy of notified prices or delay in effecting price revision.

The Department of Coal has informed the COPU that accumulation of huge losses is due to various factors viz. legacies of pre-nationalisation era, increase in wage and large investment for welfare, settlement of dues by coal consumers, non-settlement of dues by consumers, heavy capital investment, cost overruns, low productivity of labour and machines and high level of coal stocks.

The COPU also criticised the government for inordinate delay in taking a decision on restructuring of the Coal India Limited and its subsidiaries. It said that the COPU was informed by the government as back as in November 1981 that the restructuring of the CIL and its subsidiaries was under active consideration and since then a number of committees appointed by the government have examined the matter but the final decision was still eluding.

Observing that there had been an "inordinate" delay on the issue, the COPU asked the government to take a final decision without any further delay. The COPU also recommended reconstitution of the board of coal companies. Observing that there are certain imbalances and lacunae in the present set up, like the CIL has no nominees on the board of its own subsidiaries whereas all the chairman and managing directors of the companies are on the board of the CIL.

The COPU also asked the government to accord priority to underground coal mining projects. The committee observed that at present the ratio of coal produced from the underground mines and open cast mines is one-third and two-thirds respectively.

"Admittedly better quality of coal lies in underground mines. In view of this situation, the committee has emphasised the need to increase the coal production from underground mines. For this, besides, coking coal projects, priority has to be accorded to underground projects also," the committee said.

NO MAJOR CHANGE IN SAIL SUPPLY POLICY

The Steel Authority of India Ltd. (SAIL) has drawn up its new distribution guidelines which would come into effect from July 1, 1992. The new policy, according to the Director (Commercial) of the organisation, **Mr. S. Ramakrishna,** will not find any major difference between the erstwhile JPC distribution guidelines.

In a meeting with the members of the Federation of Engineering Industries in India (FEII), Mr. Ramakrishna, said that SAIL would follow the principle of five years off-take of the units and also the quarterly booking system.

Besides this, the consumers wanting to book for longer period for an assured supply against their one year to two years requirement can do that under the new LTC system. Units with an off-take per quarter will not have to do any booking and SAIL would supply them off-the-shelf through their stockyards network.

The SAIL director hoped that with this system the regular customers would not face any difficulty. In the policy there would also be adequate protection of the interest of the new units as well as of sick units who would continue to get supplies from SAIL. He further informed that the erstwhile compact group of industries has been dismantled and the consumers have been categorised under eight different groups.

Mr. Ramakrishna also assured the industry that the requirements of industries like coated steel and precision tube makers for thinner gauge materials in below 0.8 mm thickness would be suitably covered in the production plan of SAIL for 1992-93.

For sorting out the problems of the consumers, Mr. Ramakrishna said that he would regularly meet with the representatives of the industry in April and October. Referring to the pricing policy of the organisation, he said that SAIL would not increase its prices more than once or twice or at the most thrice in a year. This, he said, would enable the industry to plan the production without any fear of price hikes.

Record performance by NLC

Neyveli Lignite Corporation (NLC) has created new records in most fields of its operation during the year ended March 31, 1992. The NLC Chairman, **Mr. R. Gupta,** said in an interview to PTI that the corporation, engaged in lignite mining, power generation, fertiliser production and manufacture of coke for domestic use achieved output levels in excess of targets during the year.

For the first time in NLC's history, the total power generation from the Neyveli complex crossed the 8,000 million-unit mark to reach 8,009.08 million units, well above the target of 7,750 million units set for the year, he said.

He said the record performance was despite crippling adversities like the flooding of the entire lignite bed of mini-II because of unprecedented rains in November last, resulting in suspension of mining operations for nearly two months.

Another problem was the presence of 'marcosite', an impurity in lignite from mine-II, causing excessive slagging in thermal power station (TPS-II). But for these, power generation would have been still higher, he said. Another area of record performance was coke manufacture, where the production from NLC's briquetting and carbonisation plant reached 2,70,213 tonnes, much more than the achievable capacity of 2,62,000 tonnes and the previous year's production of 2,55,457 tonnes. Lignite production during 1991-92 at 125.43 lakh tonnes was also a new record, Mr. Gupta said.

Production of urea from NLC's fertiliser plant at 1,35,169 tonnes was, however, lower than the full capacity of 1,52,000 tonnes, but Mr. Gupta contended that the capacity should be fixed at 1,29,200 tonnes.

When the plant's feedstock was changed from lignite to fuel oil in 1979, the Coal Ministry had downrated its capacity to 1,29,200 tonnes, but the Fertiliser Department continued to reckon the capacity at 1,52,000 tonnes. Thus, an illusion was created that the fertiliser plant was functioning below capacity, Mr. Gupta said, adding NLC was planning to represent against the fixation of the capacity at 1,52,000 tonnes.

Mr. Gupta said NLC had a bunch of new projects on hand, costing well over Rs. 3,300 crores. Of these, the life extension programme of TPS-I, expansion of mine-II's capacity from 4.7 million tonnes to 10.5 million tonnes, addition of two more units of 210 mw capacity each to TPS-II and revamping the briquetting and carbonisation plant were of high priority.

The nine units of the TPS-I, with a total capacity of 630 mw, are more than 25-30 years old. Normally, units of this vintage are scrapped. However, under the life extension programme, they would be revamped at a cost of Rs. 315 crores, enabling them to function smoothly for at least another 15 years, Mr. Gupta said.

Comparatively a new unit of 630 mw capacity would cost about Rs. 1,800 crores, he pointed out.

Mr. Gupta also sought to dispel the impression that the ground water taken out of NLC's mines lowered the water table in the area. The water from the mines came out from a depth of more than 40-50 metres, and not from the level referred to as the water table.

Rather than lowering the water table, NLC's operations were in fact augmenting water availability in the area by supplying water from levels that would not be reached by wells or bore pumps, Mr. Gupta said.

Call for effective absorption of imported technology

The West Bengal governor, **Prof. Nurul Hasan,** urged industry to restrict itself to import of technology to those that could not only be absorbed but even be developed within the country. Delivering the inaugural address at a seminar on absorption of imported technology in eastern India, sponsored jointly by the Department of Scientific and Industrial Research (DSIR) and Confederation of Indian Industry (CII), Prof. Hasan said that unless state-of-the-art imported technology was absorbed and developed within the country, not only would it result in the proliferation of screwdriver technology but would also hinder domestic industry from being globally competitive.

Prof. Hasan said that while importing foreign technology, companies should bear in mind the production of goods that have a good market not just within the country but would also provide opportunities for exports. However, in its quest for imported technology, industry should bear in mind its social responsibilities and the socio-cultural realities in India, he said. It must also help the labour force to gain in strength and live life better.

Agreeing upon the need for imported technology in select areas, the governor observed that domestic technology should also be allowed to survive. "I want the breeze of modernisation to blow in but I want my industry to survive too." Prof. Hasan lamented that imported technology in many cases was "old-fashioned, outdated and high-cost" and urged industry to go in for import of latest technology.

He stated that while institutes in the country churned out the best of brains, the contribution of brilliant Indians in the area of science and technology was mainly overseas, owing to the lack of facilities for R&D in the country. In his keynote address, **Mr. N. Biswas,** Secretary, Technical Development and Director General of Technical Development, urged industry to make concerted efforts to upgrade technology and upgrade the quality of goods manufactured so as to carve a niche for its products in the global market.

Mr. Biswas called upon industry to avoid repetitive import of technology and lay stress on technology absorption and upgradation of design capability. To enable this, development of in-house R and D was imperative.

Stating that industry in West Bengal had the second-highest number of foreign collaboration in the country, he said that while growth in traditional areas such as jute, tea, coal etc. had stagnated over the last few years, the growth in other areas like steel, aluminium, electronics and the like had not been significant. In this connection, he suggested the speedy development of sectors such as fishing, food processing and leather goods.

Mr. Biswas said Bihar should exploit its vast reserves of natural resources while Orissa could develop aquaculture, electronics and agro-based industries. In his opening address, **Mr. K.V. Swaminathan,** adviser in the Department of Scientific and Industrial Research, said absorption of imported technology had not received the kind of attention it deserved and urged industry to direct its efforts in this direction.

Stating that expenditure on R and D was a mere 0.7 per cent of the turnover of recognised units and was almost absent in small-scale industries, Mr. Swaminathan called upon units to invest more in R&D. Over 1200 in-house R&D units contributed about Rs. 800 crore for R&D, 'which is small in a country of our dimension and industrial production,' Dr. Swaminathan said. Dr. Swaminathan regretted that the benefit arising out of technology absorption was not very well understood. The main beneficiary was the industry and through it, the country.

NRI INVESTMENTS MADE EASIER

Indian companies, proprietary or partnership firms will not be required to approach the Reserve Bank of India (RBI) for permission for accepting capital contribution from non-resident Indians or for issue of shares and debentures to NRIs or overseas corporate bodies (OCB) on non-repatriation basis.

RBI announced on April 28 that with a view to simplifying the procedures relating to NRI investment, regulations governing direct investment by NRIs on non-repatriation basis in proprietary or partnership concerns and shares or debentures of Indian companies have been liberalised further with immediate effefct, a press statement said.

Two notifications have been issued in this regard. One notification grants general permission under Section 9 read with Section 29 of the Foreign Exchange Regulation Act (FERA) 1973 to proprietary or partnership concerns in India engaged in any industrial, commercial or trading activity for accepting investment by way of capital contribution from NRIs and also permitting them to invest in such concerns.

The second notification permits Indian companies to issue shares or convertible debentures to NRIs or OCBs on non-repatriation basis under Section 19 read with Section 29 or FERA 1973. RBI said the investment is subject to the condition that the capital invested and income accruing thereon will not be allowed to be repatriated outside India at any time in future. The investee concern or company has to file a declaration in the prescribed form within 90 days from the date of accepting investment.

Infrastructure sector achieves targets for 1991-92

After two years of stagnation, the infrastructure sector hit its annual targets for 1991-92. Coal, steel, POL and power which had been trailing far behind the targets since 1988-89 have met the target this year.

Though infrastructure growth in the first 10 months was sluggish, it improved substantially in the last quarter of 1991-92. The Home Ministry and the Cabinet secretariat is believed to have taken steps to improve the law and order situation in the coal and steel belt. POL production, however, continued to nose-dive and only 30 million tonnes were produced against the target of 33 million tonnes.

According to sectorwise figures compiled by the Ministry for Programme Implementation for the year as a whole, even coal production which had been registering sluggish growth managed to exceed the target by one million tonnes. Against the target of 228 million tonnes for the year the Coal India companies produced 229 million tonnes.

An encouraging feature in 1991-92 was that even Singareni Collieries, stagnating at 17 million tonnes of coal production for the last several years, achieved 20.4 million tonnes of production against a target of 20.5 million tonnes. Similarly power generation was three billion units (BU) more than the production. Against a target of 283 BUs, actual power generation was 286 BUs. Hydel generation registered the highest growth.

Against a target of 64 BUs, actual production was 72 BUs. However, thermal generation fell short of the target by three BUs. Against a target of 211 BUs, the actual production was only 208 BUs. The poor coal movement to the power stations is cited as the major reason for the slippage. Atomic generation continued to cause concern and remained at 5.5 BUs against a target of 6.8 BUs. The Railways loaded 338 million tonnes of the revenue earning traffic against the target of 335 million tonnes. Despite an improvement in its performance, had the organisation adequate rolling stock, it could have easily lifted three million tonnes of additional traffic.

Steel production was slightly below target at 10.54 million tonnes against the target of 10.64 million tonnes. However, the MPI was not happy with the performance of the steel sector as 1991-92 annual target was lower than the 1988-89 target which was 10.85 million tonnes.

The ministry in an in-depth report on the performance of core sectors to the Cabinet secretariat has written that steel plants are utilising only 80 per cent of their installed capacity.

BHASKARA AGROCHEMICALS TO GO PUBLIC

Bhaskara Agrochemicals Ltd., a leading manufacturer of fertilisers and pesticides in Andhra Pradesh, plans to go public in September to part-finance its Rs. 8-crore new plant to produce quality pesticide formulations. Managing director **P. Pattabhirama Rao** and managing consultant **M.C. Das** said the plant, which would produce 1,000 tonnes of technical grade organo phosphorous pesticides along with their intermediaries, would be located in the Nalgonda district.

The knowhow had been provided by the Indian Institute of Chemical Technology, Hyderabad. The plant would start commercial production within one year. The equity cost would be met to the extent of Rs. 3 crores by the promoters, Rs. 2 crores from the public issue and Rs. 3 crores through term loans.

Highlights in Chemical Technology

CONVERTING PLASTICS INTO OIL IN REFINERIES

Upto now, most efforts to reuse plastic wastes have focussed on recycling, converting the waste into other plastic products, or burning the waste to recover energy. But now, a fourth alternative, converting plastic wastes into basic chemicals in petroleum refineries, is being explored at Amoco Chemical Co.. (Naperville, Ill.).

The process basically consists of cleaning the waste plastic, dissolving it in a hot refinery stream and processing the product as in a conventional refinery. Amoco has run a number of plastic wastes through refinery pilot plants. For example, polystyrene was cracked to give high yields of aromatic naphtha, polypropylene to very high aliphatic naphtha, and polyethylene to light petroleum gases and naphtha.

The plastic feedstock should cost at the rate of 5.5 cents per lb. to compete with crude oil. (*Chem. Engg.*, July 1991, p.23).

A MORE SELECTIVE STRIPPER FOR REMOVING CYANIDES

At Achema, Degussa AG's industrial chemical division, presented a formaldehyde process that removes cyanides from the waste water used to scrub overhead gas in pig-iron production. The route is more selective than the traditional caustic wash, in which upto 60 times more caustic is employed because carbon dioxide in the flue gas is also absorbed.

Cyanide, which is present at the levels of 10 mg/m^3 in the overhead gas, reacts with formaldehyde in a wet scrubber to form gluconitrilic acid. This is oxidized by hydrogen peroxide to gluconic acid, which is removed in a sedimentation trough. The unreacted formaldehyde is recycled to the top of the scrubbing tower. Fullscale testing with a gas flow of 50,000 m^3/hour has shown that cyanide levels can be cut to as low as 0.1 mg/lit. (*Chem. Eng.*, July 1991, p.19).

NEW NATURAL PRODUCT EXTRACTION METHOD

Microwaves are the basis of a new technique for extracting natural products such as essential oils, fatty acids and pigments. The technique/process consists of disrupting the ultra structural properties of the material to be extracted by irradiating it with microwaves while immersed in an extractant that is relatively transparent to microwaves. Microwaves pass freely through the extractant and quickly heat residual water in the inner glandular and vascular systems of the materials to be extracted. The resulting expansion ruptures the systems, allowing the contents to flow freely into the unheated extractant. Ease and speed of action are the technique's main advantages. A typical extraction of mint essential oil, for example takes about 30 seconds, compared with more than 90 min. for comparable yields using conventional steam distillation extraction. The new technique has been patented (U.S. 5,002,784) & negotiations are underway with European and Asian flavor and fragrance companies. (*C & EN.*, July 15, 1991, p. 29).

A NYLON ROUTE THAT IS NON-POLLUTING

In the wake of reports that nylon production may be a major source of ozone-depleting nitrous oxide, Maurice Brookhart, a chemistry professor at Univ. of North Carolina (Chapel Hill) has come up with an improved route to adipic acid, a key nylon intermediate. The standard way to make adipic acid is by two-stage oxidation of cyclohexane by nitric acid, during which nitrous oxide forms a by-product. To eliminate this, Brookhart designed a rhodium-based catalyst that can link two molecules of methyl acrylate 'tail-to-tail'. The product, a six-carbon hexenedioate, is then converted to adipic acid.

There are a number of patents for using metal catalysts to make adipic acid, but this is the best way discovered so far. Du Pont Co. (Wilmington, Del.) a major nylon producer, is paying for the patenting process and has first rights to it. (*Chem. Eng.*, June 1991, p.17).

A MORE EFFICIENT ETHANOL PROCESS MAKES PROGRESS

A demonstration plant to produce ethanol from corn fiber — and not just corn starch — will be built at New Energy Co. of Indiana's South Bend plant, under a contract with the developer, U.S. Department of Energy, Solar Energy Research Institute (SERI, Golden, Colo). Currently the facility produces fuel-grade ethanol by fermenting the starch in corn, but the fiber stays with the residual protein and oil, which is sold as animal feed.

The process called simultaneous saccharification and fermentation (SSF) increases ethanol yields without degrading the feed's value. The fiber's cellulose, a glucose polymer, is hydrolysed to simple glucose using the enzyme cellulose; hemicellulose a xylose polymer, is hydrolyzed by dilute sulphuric acid xylose, which is converted to xylulose, an isomer, by xylose isomerase enzymes.

The glucose and xylulose are then readily fermented to ethanol by yeast. The ethanol-conversion efficiency is 85-90%. Xylose isomer is normally produced by the bacteria *E. Coli*, but SERI has used genetic engineering to increase its production and reduce the cost. (*Chem Eng.*, June 1991, p. 17).

A WASTE-TREATMENT PROCESS THRIVES ON HORSE-POWER

Horse manure has a new role: cleaning up industrial waste water. The manure hosts bacteria that decompose water-soluble organics into carbon dioxide and water. An American Co. is capitalizing on this fact with a system called **Bio-Gest** whose largest model can treat 1000 gal/mo. of water. Costs are less than \$2/gal. against \$2-\$5/gal for dumping. The Bio-Gest unit consists of an 18-inch thick layer of manure on top of a layer of rocks that are supported by screens. Waste water (upto 3% organics) is sprayed over the manure, while warm air (@100°F) is blown up through the screens to enhance bacterial activity. The organics decompose and are carried up by the air to be cleaned in an activated carbon filter; water vapour in the air is condensed and revised.

The company has developed the system to clean up rinse waters from its paintings and silk-screening operations. It has since sold a few units for treating ink wastes. (*Chem. Eng.*, June 1991, p. 21).

WATER-BASED PAINT

A Japanese company, Nippon Paint Co. Ltd., has succeeded for the first time in the world in using a water-based paint for automobiles. This follows the development of new hardening system and viscosity control by ultrafine grains, to prevent atmospheric contamination by conventional organic solvents.

Nippon Paint has started negotiations with Japanese car makers to apply the new technology to their coating lines. Automobile coating includes a prime coat, middle coat and two types of final coat (base coat and top coat). The use of water-based paint for the middle and top coats have not yet been developed worldwide. Water-based paint generally undergoes degradation in coating quality in high humidity. The new development provides good quality at a humidity of 85 per cent. (*PTI Science Service*, Oct. 13, 1991).

HOECHST CELANESE EXTRACTION PROCESS SEEN AS MAJOR ADVANCE IN SEPARATION SCIENCE

Hoechst Celanese Corporation is touting a new extraction technology that may allow development of exceptionally pure drugs and could revolutionize and miniaturize waste water treatment and other envionmental processes.

The technology called 'Liqui-Cel' is a membrane-assisted, liquid-liquid extraction process developed by the company's separation products division. It permits extraction and transfer of a component from one fluid to another without mixing the two liquids.

The technology uses modules ranging from a slim unit, two feet in length, to one the size of a refrigerator. This compares with conventional extraction systems which require mixing and dispersing liquids in huge tanks or columns hundreds of feet tall.

Product manager, Jerry Patton, says one pharmaceutical company substituted a 'Liqui-Cel' hollow, fiber-membrane extraction unit comprised of three 24-inch modules, each two inches in diameter, for an extractor that required two 2500-gallon stainless steel tanks.

According to Mr. Patton, extraction in the Hoechst Celanese System occured at the point at which the fluids contact one another — actually within the hollow fiber's microscopic pores. "The membrane itself does not contribute to the actual extraction and transfer of the component from one liquid to another", he says. "It is simply the vehicle for very efficiently bringing the two fluids together without mixing them. The company believes the new technology will allow chemists to use a much broader spectrum of solvents in their separations work. Potential applications include deriving very pure antibiotics and other drugs, more completely separating dissolved metals and hazardous chemicals from process liquids and more precisely extracting food and beverage flavours and aromas.

In the environmental area, the technology may give small communities and municipalities an affordable way to share a profitable wastewater treatment system, which could be moved from site to site.

Hoechst Celanese says miniaturization can bring significant cost savings; the big steel tanks and mixing units used in conventional liquid-liquid extraction can cost \$150,000 or more; smaller 'Liqui-Cel' modules can cost a fraction of that, it says.

The technology arose from research conducted jointly by Hoechst Celanese and a team lead by Dr. Kam Sirkar at Hoboken, N.J. based Stevens Institute of Technology. Before the technology was commercialised, a lab-scale trial was undertaken by Hoechst Celanese & the pharmaceutical maker Merck & Co. (*CMR*, January 27, 1992).

ZEOLITES: IMPROVING LIFE

For the past 10 years, between teaching budding chemical-engineering students at California Institute of Technology, Professor Mark E. Davis has repaired to his campus lab to play with piles of sand. Davis' speciality is zeolites — grains made of silicon, aluminium and oxygen that are used as catalysts in oil refining. Molecules of crude enter thousands of tiny holes in zeolites, where they react with an acid and break down into gasoline, heating oil and various other byproducts.

Davis' goal is to create synthetic zeolites with bigger pores to accommodate large oil molecules in the heaviest crude. Enlarging these pores by just a billionth of an inch could be a big deal: The National Research Council says a one per cent increase in the gasoline-making efficiency of catalysts would save 22 million barrels of oil a year and cut the United States' trade deficit by more than $400 million.

The prospect has lit a burner under chemistry labs around the country. For decades, new catalysts have been developed mainly by trial and error. Scientists knew that they worked without understanding how. But recent advances in lab equipment have provided the first glimpse of how individual atoms are arranged on the surface of catalytic materials.

This knowledge is turning what has long been an art into a science aimed at designing catalysts for specific jobs. Among the many advances this could eventually lead to are miraculous new medicines, "nanoscale" computer circuits and more efficient solar power devices. And instead of just cleaning up pollution, "designer catalysts" might avoid it in the first place.

Catalysts are the marriage brokers of chemistry; they help form new chemical bonds in other materials to make a desired product, then emerge unchanged and ready to start over again. Products made this way already represent about a quarter of America's GNP. Industrial catalysts turn chemicals into everything from plastics to paint to drugs. And biological catalysts, called enzymes, help make food, drink and detergents.

Zeolites are a case in point. Nature's brand is dug from rock quarries. But chemists such as Davis are crystallising new varieties from different materials. For instance, one way to get the bigger holes for processing heavier oil is to substitute phosphorus for silicon in a zeolite's structure. So Davis is trying to make larger-pored sieves from sturdier silicon. He and others are also designing zeolite membranes that would streamline the refining process by separating oil products in one step. Currently, energy-intensive distillation columns vapourise oil and cool the resulting gases to separate various products.

Zeolites are replacing polluting phosphates as water softeners in laundry detergents, where they act as miniscule sponges to soak up minerals that make water hard. Meanwhile, some scientists hope to turn sieves into tiny electronic and optical devices. One goal is making chemical sensors that would trigger an alarm when molecules of a particular gas or pollutant entered their pores. Another use, says Geoffrey Ozin, a chemist at University of Toronto, might be to house tiny semiconductor transistors or switches, that have superior electronic and optical properties.

But for all their diversity, zeolites can't match the exquisite precision of enzymes. These biological catalysts influence all chemical reactions in the body and some outside. The ability of enzymes to break down carbohydrates and process sugars, helps in making food, beverages and stain-eating detergents. And now they are being put to more exotic uses. Celgene Inc., a biotech company, has built a library of 7,000 microbes or micro-organisms that contain enzymes. Among these there is a bacteria that attacks methylene chloride, a carcinogen on the Environmental Protection Agency's most-wanted list. Placed in a bioreactor in a factory waste stream — at one General Electric plant so far — microbes convert the toxin into carbon dioxide, water and salts.

Celgene is also using enzymes to purify drugs. The key molecules occur in two slightly varying forms, each of which may have hugely different effects. Eliminating the undesirable form is difficult and costly. But Celgene has found enyzmes that can do the job quickly and cheaply. Celgene says the market may exceed $3 billion within a decade. An even more dramatic development is the engineered abzyme or catalytic antibody. This technology gives antibodies — disease-fighting proteins — the ability to enhance chemical reactions the way enzymes do. "Once you can custom-tailor enzymes", says Peter G. Schultz, a chemist at the University of California at Berkely, "you have many more opportunities to cure illness." Some 50 abzymes have been developed including one that may fight skin cancer by repairing DNA damage.

Meanwhile, scientists are using light and sound as catalysts. In photosynthesis, sunlight acts as a catalyst to spur chlorophyll-containing cells to make food for plants. Now researchers are close to capturing the energy generated by this. In another form of photocatalysis, scientists are purifying groundwater contaminated by the solvent trichloroethylene, which is used in cleaning machinery. The water is run through tubes containing titanium dioxide crystals. Sunlight reacts with the crystals to degrade the contaminants into harmless products. Project leader Hal Link at the National Renewable Energy Lab points out that existing methods merely transfer toxins onto filters or into the air.

Scientists are even looking to high-frequency sound waves, or ultrasound, to spur catalytic reactions. When such sound is radiated through liquids, it causes gas pockets to expand and collapse within fractions of a second. This creates tiny spots as hot as the surface of the sun — 9,600°F — plus pressures equal to those on the sea floor. These conditions might make catalysts work better in many production process.

Indeed, chemist Kenneth S. Suslick at the University of Illinois at Champaign-Urbana has used ultrasound to make a purer form of "amorphous" iron. Amorphous metals are used in magnetic recording heads and as a corrosion-resisant coating. (*Business Week*).

Science Briefs

"LIVE FILTER" FOR DISTILLERY EFFLUENTS

Artemia, a crustacean that survives best in the most polluted waters, is emerging as a "living filter" for the secondary treatment of distillery effluents. Studies on effluent treatment using Artemia were conducted by a team of zoologists from the A.V.V.M. Sri Pushpam College, at Thanjavur in Tamil Nadu, and the findings published in the *"Indian Journal of Experimental Biology"*. The trials were done at a distillery unit of a sugar factory at Erode, using adult Artemia samples collected from the solar salt works at Vedaranyam in Thanjavur and acclimatised to laboratory conditions. That the organisms survived best in the most polluted waters was illustrated in one set of trials in which the survival rate increased with increase in the concentration of effluents.

In waters with low effluent concentration, many of the Artemias died due to non-availability of organic food, and empty guts were seen on examining the dead animals. The animals reduce upto 69 per cent of the total solids and 33.4 per cent of the biological oxygen demand (BOD), the report says.

Artemia, being a non-selective filter feeder, filters all biological particulates less than 50 micrometers in diameter. Also the organism can regulate the rate at which it ingests the food and filters the effluents. The study has revealed that Artemia may be used as a living filter for screening suspended solids, thereby reducing the organic load and BOD, the report concludes.

P.T.I. Science Service
April 16-30, 1992, p. 1.

INDIGENOUS TECHNOLOGY FOR CLEANING COTTON

Cotton technology experts at the South India Textile Research Association (SITRA), at Coimbatore in Tamil Nadu, have developed a cotton cleaner working on the principle of aerodynamics. They have called it SITRA Kapas Impurities Purifier, 'SKIP' for short.

As of today, cotton bolls are picked from the fields by hand and brought to ginning factories for further processing like removing seeds, making lint and baling before being sent to textile mills for spinning yarn and weaving fabrics. The hand-picked bolls are cleaned a little manually before ginning. However, impurities like dust, cotton plant stalks, dried grass, and immature and insect-infested bolls are still present.

The trash content of Indian cotton is very high (8 to 10 per cent), compared to machine-picked American cotton (1 to 2 per cent). It is even less in the case of Egyptian cotton (0.8 to 1 per cent). Trash in cotton affects the quality of lint, which in turn affects the quality of yarn and fabrics from the point of view of appearance and blemishes.

Immature bolls contain fibres which are not fully developed, and yarns spun out of these imperfect fibres are weak. In case the immature bolls are not removed before ginning, they get mixed with fully developed bolls and the resulting lint contains a relatively higher percentage of immature weak fibres. Indian cotton is also prone to seed coat fragmentation during ginning. Poor machinery as well as outdated ginning technology are also responsible for the high seed content in Indian cotton.

Some of the seeds get fragmented in the spinning mills, resulting in imperfect yarn and blemishes in finished fabrics. The practice of systematically pre-cleaning the cotton before sending it for ginning is practically absent in India. Most of the ginning factories use some local hand-operated equipment for cleaning, the efficiency of which, if any, is very poor. Keeping these problems in mind, the SITRA scientists have designed an indigenous pre-cleaning machine.

The SKIP can be used to clean cotton as soon as it comes to the ginning factory as well as to clean the lint after ginning is complete. It treats the cotton bolls collected from fields and separates immature bolls as well as heavy impurities in the first stage. Pre-cleaning before ginning reduces trash, the bulk of which is immature bolls. During pre-cleaning, cotton bolls are well opened and therefore the loss due to attachment of fibre to seeds is minimised.

SKIP has also been used by SITRA scientists to clean cotton lint produced by a ginning factory. During trials it was found that the trash content was reduced to nearly half in the case of Ugandan variety of cotton, while the corresponding figure for Karunkanni variety was near about the same. The seed coat percentage also came down.

As a pre-ginning cleaner, there was a distinct improvement in the evenness and strength of the yarn. This could be attributed to removal of immature bolls. The number of imperfections was also reduced to a great extent, mainly due to removal of seed coat fragments. The technology has been passed on to a textile machinery manufacturer based at Coimbatore.

P.T.I. Science Service
April 16-30, 1992, p. 1.

DRUG DETECTION KITS FOR NARCOTICS

A colour spot test kit for narcotics and other abused drugs has been developed by the National Chemical Laboratory (NCL), Pune, at the instance of the Narcotics Control Bureau. The NCL kit, being manufactured by the Hindustan Antibiotics Limited (HAL), costs much less than the imported kits and can

be used even by non-technical personnel. The suspected samples can be tested for the major groups of abused drugs such as opium, derived drugs like morphine and heroin, cannabis preparations such as "charas" and "ganja", cocaine and barbiturates. The testing is done by mixing the samples with a few classified reagents and observing the colour developed; reports the Council of Scientific and Industrial Research (CSIR). NCL is s laboratory under the CSIR.

P.T.I. Science Service
April 16-30, 1992, p. 3.

CFRI PROCESS FOR SMOKELESS BRIQUETTES RELEASED TO INDUSTRY

A process developed by the Central Fuel Research Institute, Dhanbad, for the manufacture of smokeless, water-resistant fuel briquettes has been released to industry. A Kanpur-based firm would set up a 25-tonnes-per-day capacity plant using low-grade coking coal from Jharia coalfields and washery midlings or sinks from the Dugdha coal washery. Commercial production is expected to start by June this year.

The CFRI process consists of initially crushing the raw material, primarily midlings or low-grade coking coal, to optimum fineness and mixing it with an inorganic binder. The mixture is briquetted by a low-pressure twin roll press and the resulting green briquettes are devolatilised in a self-heated devolatiser. The total anticipated investment for a 25-tonnes-per-day plant is between Rs. 1.2 and 1.5 million, depending on the extent of mechanisation, reports a newsletter of the Council of Scientific and Industrial Research (CSIR). CFRI is a laboratory under the CSIR.

P.T.I. Science Service
April 16-30, 1992, p. 3.

NEEM OIL: HERBAL CONTRACEPTIVE

A solution to the world's population problem may be found in the neem *(Azadirachta Indica)* tree that Indians grow in their backyards. So say researchers in New Delhi who have amassed impressive evidence from animal experiments to show that oil from neem seeds is a potent contraceptive.

A clinical trial with neem oil on Indian women is being launched by the National Institute of Immunology (NII) which says the development of this contraceptive "is the result of combining ancient wisdom with modern science". Neem's medicinal and insecticidal effects are part of Indian folklore. People clean their teeth with brushes made from neem twigs, burn its leaves to drive away mosquitos, and use neem paste to disinfect stored grains at home.

Now they are told they may be able to limit their family size with a cheap, safe, herbal contraceptive that literally grows in their backyards. The potential of neem oil in birth control was first realised in 1984 by the Defence Institute of Physiology and Allied Sciences (DIPAS) in New Delhi. NII and DIPAS are now competing with each other to bring into market a contraceptive based on purified neem oil. Raw oil has 28 compounds some of which are toxic.

The NII product is a purified fraction, called Praneem, that was declared safe by toxicologists at the Post Graduate Institute for Medical Research in Chandigarh. In the proposed trial, women will receive a single injection of Praneem directly into the uterus. The contraceptive effect is expected to last for several months.

The basis for the trial is NII's observation that rats, rabbits and monkeys remained infertile for as long as six months after a single dose of 100 µl of neem oil into the uterus. Shakti Upadyay of NII says the oil apparently "initiates a local cell mediated immune response" in the uterine compartment leading to blocking of implantation. "Even if it works for three months in women", says G.P. Talwar, former NII director, "we will have a vacation contraceptive"

DIPAS, on the other hand, is trying to introduce a spermicidal preparation that is easy to use. "Neem oil kills spermatoza in 30 seconds", says DIPAS deputy director Col. S.S. Riar whose studies on animals as well as 12 wives of Indian army personnel showed 100 per cent efficacy with this method with no side effects. Riar says his institute will soon be seeking drug controller's permission to launch a clinical trial of its spermicidal preparation containing DK-1, an active principle isolated from one of the volatile fractions of neem oil.

"We have developed an applicator with which even an illiterate woman can introduce the preparation into the cervix before intercourse", says Riar. The DK-1 preparation is said to have a shelf-life of over six months and costs 5 paisa (one-six hundredth of a U.S. dollar). NII's Praneem is also available in a cream form but plans for human trial with this product have been deferred until later this year. Talwar says vaginal neem cream will have the added bonus of checking sexually transmitted diseases and even possibly AIDS. Recently, says Upadyay, an in-vitro experiment at Harvard Medical School, confirmed neem oil's action on HIV.

Riar says that neem oil given orally in animals, in early stages after conception, was also found to prevent implantation of the embryos thus acting as an abortificient. "Our team is now trying to isolate the active principle responsible for the anti-implantation effect", says Riar. Once this step is over DIPAS plans to conduct a human trial with this product also.

The Indian Council of Medical Research says it will give a big push to neem-based contraceptive research but cannot initiate several clinical trials all at once.

One more proposal with the ICMR is for a trial of neem oil's effect in controlling male fertility. NII has found that injecting neem oil into vas defrans prevented spermatogenesis in male rats, thus providing a possible alternative to vasectomy.

P.T.I. Science Service
April 16-30, 1992, p. 6.

GENE THERAPY: CRACKDOWN ON CULPRIT GENES

Medical researchers are painstakingly tracking down defective genes responsible for several common disorders that are expected to eventually surrender to gene therapy. Recent advances in asthma, high blood pressure, cystic fibrosis, haemophilia-B, muscular dystrophy and cancer are renewing hopes of tackling some of the most defiant diseases in medical history.

Gene therapy strikes at the root, as scientists attempt to replace or correct the defective gene, or supplement it with a normal functional gene. The assumption behind this approach is that the genetically altered cells will proliferate and overwhelm their defective kin. Two research teams in the United States last year received the green signal for gene therapy experiments of a limited number of human patients one group working on cancer and the second on cholesterol.

Scientists from the National Cancer Institute and National Heart, Lung, and Blood Institute jointly began work on treating cancer patients with genetically altered cells grown from their own tumours. The researchers took tumour cells from a cancer patient and altered them to produce large quantities of an anti-tumour toxin which is believed to make the tumours more susceptible to attack from the man's own immune system.

The second group of scientists, from the University of Michigan Medical Center, will aim to insert a gene into liver cells of patients with high cholesterol, to help them remove excess cholesterol. Genes may also soon join immunisation programmes, with researchers at the Southwestern Medical Center in Texas devising a method to directly inject genes responsible for antibody formation into a system.

"Genetic immunisation may be time and labour-saving in producing antibodies", a report by Stephen Johston and co-workers in *"Nature"* says. The current vaccination procedure involves injection of the purified protein which takes long time to prepare in sufficient quantities. The scientists tested two genes — one that codes for the human growth hormone (HGH) and another which codes for human alpha-I antitrypsin.

A majority of mice which were inoculated in the ear with gold microprojectiles coated with either gene produced antibodies within a week. Mice vaccinated with both genes at the same time produced antibodies to both proteins. The trials also showed that the immune reaction generated by the injected gene could be boosted. When mice that had a primary genetic injection and were producing anti-HGH antibodies were given a second dose of the gene, they showed an enhanced immune response.

Similar results were obtained in mice innoculated with the gene for human alpha-I-antitrypsin. One of the most common disorders — asthma — was in news recently when British doctors narrowed their hunt for the culprit gene. A research team at the John Radcliffe and Churchill hospitals in Oxford had narrowed the search to just 100 of the many thousands of genes that are contained within the human body, leading the team members to predict that pinning down the exact gene may be only a few months away.

Once the gene has been found, the Oxford scientists will try to clone it so that they can study the protein it makes, and tailor drugs to counter it. Three years ago, the team had tracked down the chromosome on which the asthma gene was located and last year they managed to locate the exact region on chromosome 11 that contains the gene, says a report from London.

An innovative Anglo-U.S. technology is offering hopes of treating haemophilia-B with gene therapy within a few years. In haemophilia-B, which accounts for 15 per cent of all haemophilia cases, the gene that codes for a clotting protein called Factor IX is missing or defective. The deficiency lead to profuse bleeding both internally and externally, either spontaneously or from relatively minor injuries.

The new technology, the result of work on haemophilia-B gene by scientists at Oxford University and the University of Washington in Seattle, incorporates cloned healthy genes into the cells of haemophilia-B patients so that they can continuously make their own supplies of Factor IX. Research on hypertension too has begun to focus on gene therapy when scientists reported last year that they could identify two chromosome segments that contain genes regulating blood pressure in naturally hypertensive rats.

In many industrialised societies, high blood pressure of unknown etiology affects up to 25 per cent of the adult population and is a major risk factor for stroke, cardiac disease and renal failure. Scientists have also successfully identified markers on chromosome 10 that are believed to be linked to the gene regulating blood pressure.

A team of researchers from the National Heart, Lung and Blood Institute (NHLBI) in the United States has taken a big step toward gene therapy for cystic fibrosis when they successfully introduced a functional cystic fibrosis gene into the lung cells of live rats.

Cystic fibrosis, a hereditary disease leading to obstructive lesions, atrophy and fibrosis of the pancreas and lungs, is the most common disease in Caucasians. If the same experiments can be successfully repeated in humans, it may correct the biochemical defect produced in their lungs by their own malfunctioning gene, says *"Science"*

To introduce the cystic fibrosis gene into the rats' lung cells, the NHLBI team tagged it to the DNA of an adenovirus which infects lung cells. Before tagging, the adenovirus DNA was suitably modified so that it does not reproduce in the lung cells. The human cystic fibrosis gene was active in the rat's lung cells for at least six weeks.

Another disorder on the hit list of gene therapy is muscular dystrophy, the wasting disease of the muscle which kills one in 3,000 boys early in life. Scientists at the Royal Veterinary College in London recently introduced the human muscular dystrophy gene into fertilised eggs of mice. They are now looking for alternative ways to deliver the gene to the crucial muscles, as current guidelines on gene therapy prohibit any genetic modification of the embryos.

This may take between five and ten years, reports *"New Scientist"*. The normal healthy gene makes dystrophin, a protein that is found on the outer cell membrane of the muscle cells. The transgenic mice were not completely cured but showed substantial improvement, leading the London researchers to hope that the technique could considerably improve the quality of life of the boys.

Early last year, researchers from the John Hopkins University Medical School reported that they may have found a key gene for development of cancer of the colon. The finding might eventually help to detect colon cancer at an early stage by identifying mutations in the gene, and inhibit tumour growth with drugs that counter the biochemical effects of the mutations.

P.T.I. Science Service
April 16-30, 1992, p. 7.

NEW AND BETTER PROCESS FOR PHENOL SYNTHESIS

A research group in Japan has developed a new phenol synthesis process which gives about 30 times higher phenol yield than the conventional process, reports the journal *Techno Japan*.

According to the journal, the key to success was a fuel cell electrode of carbon fibres. The fuel cell produces electric power by electrochemical reactions between oxygen and hydrogen.

The group at the Tokyo Institute of Technology has found that phenol is produced when benzene is present in the oxygen stream. This alone, however, produces only 0.8 micromols per hour of phenol.

The cathode used in the latest test is of carbon whiskers oxidised with nitric acid, in which palladium and iron chloride are impregnated. The use of this cathode in place of the conventional graphite one produces 24 micromols per hour of phenol. Electric power produced also jumps to 24 mA which is about 40 times higher than that available from a conventional cell.

Phenol, which is a starting material for the manufacture of some resins, has a variety of other uses in the chemical industry and is commercially produced through a process called the cumene process. This method however involves a complicated three-stage process with benzene as the starting material and produces acetone as the by-product. A new process to replace the cumene process has thus been in great demand.

The new process kills three birds with one stone, the journal *Techno Japan* said, by producing phenol in one stage from benzene and electric power simultaneously, without producing acetone.

P.T.I. Science Service
April 16-30, 1992, p. 11.

CHEAPER, CLEANER IRON-MAKING TECHNOLOGY FROM AUSTRIA

An Austrian metallurgical company has developed a new process technology for the production of liquid pig iron from iron-ore that has several advantages over the conventional blast furnace route of iron manufacture. The new COREX technology developed by Voest Alpine Industrieanlagen Bay in Austria is based on a revised sequence of metallurgical processes that will reduce iron production costs by upto 50 per cent and eliminate the need for using expensive coking coal.

The new process technology has been successfully demonstrated at plants in Germany and South Africa, and Voest Alpine is now looking for buyers of the new technology in other countries including India. The COREX process uses the metallurgical processes carried out in a coking plant and a blast furnace in a different sequence to avoid the necessity of using coking coal, but produces the same quality of hot metal.

Voest Alpine says the COREX process will be specially attractive to India because it avoids the use of coking coal in iron making. India had to import 4.5 million tonnes of coking coal last year worth Rs. 500 million for use in blast furnaces. The process steps are carried out in two reactors — the reduction furnace, in which iron ore is prereduced, and the melter gassifier that has high-value reducing gas and is used to melt the prereduced iron ore.

The noncoking coal is charged into ultrahigh temperature melter gassifier and gassified into a high value reducing gas mainly made up of carbon monoxide and hydrogen. The hot reducing gas is brought to reducing temperature of about 850 degrees celsius and

introduced into the reduction furnace in counterflow to iron ore descending down the furnace under the influence of gravity. The iron ore is thus preheated and prereduced to a high degree of metallisation.

• The hot and metallised material is extracted from the reduction furnace by screw conveyors and drops into the melter gassifier underneath. It is here exposed again to a high temperature reducing atmosphere and finally reduced and melted by residual char in the lower part of the gassifier. The export gas resulting from the reduction can be used as fuel either for the generation of electric power, or for heating in metallurgical furnaces.

Voest Alpine officials say production costs via the COREX process will be about 30 to 40 per cent less than the blast furnace route for the production of pig iron. Waste and environmental emissions in the COREX route are also negligible compared to the blast furnace process, they said.

Cyanide, sulfide, and ammonium aqueous emissions in the COREX route are about 10 times lower than in the conventional blast furnace process. Phenol emissions are also lower. Gaseous emissions of oxides of nitrogen and sulphur dioxide are also nearly 60 times lower in COREX.

P.T.I. Science Service
April 1-15, 1992, p.11.

SELF-PROPELLED BELT CONVEYOR MAKES COAL MINING CHEAPER, EASIER

Coal mining productivity and profitability can be expected to improve dramatically, thanks to a self-advancing belt conveyor developed by Meco Australia, reports the *Australian Science and Technology Newsletter*.

Named the Meco Mobile Bot End (MMBE), it promises to reduce the time taken to excavate underground access tunnels in longwall coal mines. A technique called retreat longwall system is the most productive method of underground coal mining in Australia and involves tunnelling access roads around the block of coal to be mined, then extracting the blocks which are typically 200 m wide and upto two km long.

Such tunnels enable mining equipment to be transported and set up at the point of production. They allow air into the workings and they house the equipment which transports the ore out of the mine. Until these tunnels are driven, longwall mining cannot commence.

The problem is that tunnelling access roads takes longer than the extraction of coal, leading to inherent idle times in the retreat longwall mining system, says Meco engineering director Kevin Hall. Current tunnelling technique uses shuttle cars to travel between the continuous mining machine at the coal face and the stationary belt conveyor boot end. The entire tunnelling system shuts down after every 100 m of roadway is excavated while vehicles are used to drag the conveyor belt closer to the work face. This results in the loss of an average 3.5 shifts a week or the equivalent of one working day.

MMBE stops this time consuming process by linking the continuous miner to the panel belt conveyor which transports the ore to the surface. It works continuously and keeps the belt running in a true line. The machine can be extended under its own power and allows the conveyor structure to be installed at the same time in a steel-plate encased safe working area. A centrally located control station permits operation of the MMBE, reducing considerably the risk of injury from working close to a moving conveyor belt system and making the system safer than any other boot end so far developed.

The unit is powered electrohydraulically with an on-board power pack supplying hydraulics which control the tracks and other motions. At a cost of 400,000 dollars, the capital outlay is said to be significantly lower than for a two-car shuttle system of about a million dollars.

P.T.I. Science Service
April 1-15, 1992, p. 11.

NEW CATALYTIC CONVERTERS FOR LEADED PETROL AND DIESEL ENGINES

A new catalytic converter technique for two-stroke engines, diesel engines and industrial applications has been launched by REEcat IMCS AB in Laulea, north Sweden. The active substance in the converter, REElit, is patented and based on rare earth elements (lanthanides). It can be used with leaded petrol and is said to be as effective as platinum to remove hydrocarbons and carbon monoxide from exhausts.

REEcat IMCS, established in 1987, manufactures catalytical material and also sells semi-manufactured catalytic products and licences. A subsidiary company will this year start manufacture of converters for second-hand cars on the Scandinavian market. The converters are made of high-quality casing materials, a nickel alloy shock absorbing meshwork and monolithic REElit ceramics.

Tests have been conducted this winter in Sweden with snow mobiles of older models equipped with the new converter. The enginees were operated on 96 octane leaded petrol mixed with 2-3 per cent oil. Exhausts were soot-free, non smelling and non-visible, the company says. Purification values fof hydrocarbon were 70-80 per cent and for carbon monoxide 80-95 per cent. Sweden has some 140,000 snow mobiles which operate in an often sensitive environment. Their emissions of hydrocarbon are estimated at some 7,500 tons, according to calculations by

the Department of Environmental Technology at Luela University of Technology, which cooperates with the company. For diesel engines, REEcat IMCS has initiated cooperation with Unikat AB, another Swedish company marketing a wide range of converters of diesel engines.

In this cleaning method, carbon monoxide, hydrocarbons and soot particles are burnt when the hot exhaust gases pass through a bed of catalytically active pellets made of REElit. The cleaners also function as efficient silencers.

P.T.I. Science Service
April 1-15, 1992, p. 13.

DIAGNOSTIC KIT FROM MOLLUSCS

Luminescent material found in the rare pholas dactylus mollusc is to be cloned and produced by bugs for use in new diagnostic kits that are expected to help victims of arthritis, asthma, kidney failure, diabetes, heart diseases, burns, trauma and accidents, reports *London Press Service*.

The kits are being developed by the Knight Scientific biotechnology company Plymouth in Western England, where Jan and Robert Knight have been investigating the unique properties of the mollusc luminescent material for a number of years. They are now working with Exeter University's biological sciences department to produce large amount of the material from microbes that have had certain genes of the hard shelled invertebrates inserted into them.

The diagnostic kits are aimed at diseases that involve large numbers of white blood cells which sometimes become activated and produce chemicals that can damage healthy tissue. Sometimes these same cells, while still very active, lose their ability to destroy bacteria and people die from infection. The new kits, which should be available within a year for research use, will use the luminescent material along with a novel device to separate the white to glow by substances produced by the activated white cell and the light produced can be easily measured. This facility can be used to establish the effect of particular drugs on the output of the activated white cells. Pholasin can also be made to glow with certain enzymes and used as a probe to detect proteins and nucleic acids.

P.T.I. Science Service
April 1-15, 1992, p. 14.

CLEAN ANODE PASTE DOSING FROM NORWAY

A clean process for the production of anode paste for aluminium smelting is now available from Procon Engineering in Norway, reports the journal *Process Engineering*. Three innovations lie behind the claims for improved performance: closed and fully dust proof material vessels, precise forced feeding, and the loss-of-weight principle. The closed vessels cut down on the need for air filtration, ventilation, cleaning and maintenance. Each vessel has a rotating feeder capable of handling any material, including filter dust and any fraction of petrol coke and anthracite.

Liquid pitch is dosed by the same principle using a displacement pump. The common problem of belt weighers, such as dust, are eliminated by the use of vessel load cells operating on the loss-of-weight principle. The journal said full documentation of dosing and composition can be provided at any time.

This feature is useful internally, but even more so for anode sales companies with customer demands for documented quality assurance. Procon Engineering developed the process in cooperation with Hydro Aluminium and has already supplied it to five Norwegian companies.

P.T.I. Science Service
April 1-15, 1992, p. 14.

Molecular and Cellular Biology in Medical and Health Care*

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May I first say how delighted I am to speak in this opening session of GIAM-IX. It is not only an honour to me but also a recognition of the fact that modern biology has come of age in the developing world, including the country I come from, India.

INTRODUCTION

Medicine is as old as the human race itself. Broadly speaking, one can identify three phases in its development through history; (a) the ancient/medieval phase; (b) the now classical phase of modern medicine; and (c) the modern phase of modern medicine.

In the ancient/medieval phase, the emphasis was on empiricism, folklore and often, religious or pseudo-religious authority. During this period, several indigenous systems of medicine appeared all over the world - in the Middle East, in India, and in Latin America, to give examples. The Unani and the Ayurvedic systems of medicine are widely practised even today in India. It was the latter system that gave to the world reserpine, as the Latin American medical folklore gave to us quinine. In modern medicine, in contrast to ancient/-medieval medicine, the emphasis has been on the scientific method, on adequate controls and on the authority of proof.

In the first phase of modern medicine, we had antimetabolites and antibiotics, and some emphasis on understanding the disease - for example, its causative agents, pathology and physiology. Some major failures of modern medicine, at the turn of this quarter century, were cancer, viral diseases, CNS disorders, certain microbial and parasitic diseases such as leprosy and trypanosomiasis, inherited diseases of which nearly 4000 are known today, and auto-immune diseases such as rheumatoid arthritis. Diagnosis still had an element of art in it, and pharmacology continued to require extensive animal experiments which are being increasingly objected to today. In the case of many drugs, such as human insulin and TPA (tissue plasminogen activator), availability was a major factor in preventing the widespread use of the drug. The same was true of vaccines, such as the hepatitis-B vaccine, where enough antigen was not available to make the vaccine on a large scale. And we couldn't prevent drugs from finding their way to normal tissues where they mainfested high levels of toxicity.

The current phase of modern medicine, likely to continue for as long as one can foresee, has been characterised by the intergration of the biological sciences of this half-century molecular biology, cell biology and biochemistry — into the very fabric of medical knowledge and practise, so much so that the design and use of drugs, and the design of strategies for medical and health care under a variety of circumstances, now closely follows advances in this areas. Never before has new knowledge being applied so quickly as in this area. This new knowledge has opened up hitherto unforeseen and highly promising (in some cases already effective) approaches towards tackling the failures and problems I just mentioned, and others that I have not mentioned. Let us look at some of the applications of this new knowledge. In what follows, I would only be illustrative and not exhaustive.

APPLICATIONS

Easier availability of new drugs

Genetic engineering, chemical synthesis using new techniques and tissue culture have transformed the scene in regard to availability of drugs. The application of these techniques has led to production of drugs at a much cheaper cost, and much more quickly, without having to depend on conventional, somewhat difficult sources. These techniques have also opened the path towards better and purer drugs, and the possibility of their modification at little cost to produce something which would have specified advantages, for example, by site-directed mutagenesis or by fusing drug molecules. Genetic engineering has been used not only to produce drugs such as human insulin but also enzymes used in diagnosis or estimation such as cholesterol oxidase or uricase. This technique has also been used for increasing the yield of antibiotics. For example, strains of *Streptomyces* can be developed which would make extra proline or prevent proline breakdown, thus making it possible for the microorganism to produce more of a proline-containing antibiotic. David Hopwood of Great Britain has recently talked about the possibilities of activating silent genes to produce new drugs or of transferring drug-producing genes into organisms that are easy to grow.

Genetically engineered microorganisms have also been used for microbial transformation of steroids that the chemists would find difficult to mimic.

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* Plenary lecture delivered at the opening session of IX International Conference on "Global Impacts of Applied Microbiology" at Malta.

Table 1 lists some of the genetically engineered pharmaceutically important proteins that are in various phases of development, production, trial or investigation. Genetically engineered growth hormone has been reported to even reverse some of the defects ageing.

Genetic engineering technology to produce important drugs has not been confined to microorganisms alone. There has been, for example, a recent report of secretion of human TPA in the milk of transgenic goats!

The chemical synthesis of small peptides and proteins has come of age and is now commercially viable. Some of the proteins and peptides that have been chemically synthetized on a commercially viable scale are calcitonin, secretin, somatostatin, thyrotropin-releasing factor, vasopressin, LH-releasing hormone, glucagon and adrenocorticotropin, all of which have less than 40 amino acids, and seminal plasmin (recently shown by us to be a potent anti-HIV agent) which has 47 amino acids and which has been synthesized by Dr. R. Nagaraj of our laboratory. Japanese scientists have synthesized a peptide that, at a very low concentration, lowers high blood pressure caused by defects in the renin-angiotensin-aldosterone systems. Alpha-melanocyte stimulating hormone (MSH) which has potential for use in the treatment of melanomas (skin tumors) and other skin diseases and could eventually also have enormous market as a cosmetic, has also been synthesized.

The genetically-engineered vaccines

Advances in biotechnology have opened up a new approach to the development of vaccines, using antigens that have been produced through genetic engineering. This technique allows a modification of the naturally-occurring antigens to remove some of the disadvantages inherent in the natural antigen, such as instability and possibility of contamination - for example, in the case of viral antigens - with incompletely inactivated virus. Moreover, in the case of a natural antigen, sufficient amount of the immunogen is often not available - as, for example is the case with the hepatitis or the foot-and-mouth virus, or with *Mycobacterium leprae*, the leprosy bacillus.

A recent pioneering success in this area has been with the hepatitis B vaccine. In France alone, the vaccine has been tested on several thousand volunteers, and has now been approved for human use; it contains the pure viral-surface antigen which, on secretion from the genetically manipulated yeast, spontaneously forms aggregates that substantially resemble the natural virus shell, and are highly immunogenic. Ken Murray of Edinburgh has recently proposed that by linking two of the viral antigens (HBsAG and HBcAG) so far used, it may be possible to produce both humoral and cell-mediated immunity through one vaccine.

Scientists at Transgene, in collaboration with Institute Pasteur in Paris have, I believe, come close to developing a cheap vaccine for schistomiasis which affects about 250 million people in the tropical regions of the world every year. There has been progress in genetically engineering a vaccine for dengue fever, a severe viral disease that is beginning to spread now also to North America; it is mosquito-borne and has been so far endemic to much of Asia, South Africa, and South and Central America. The cloning of gene for the major surface protein of *Plasmodium falciparum*, the species that cause most of the severe malaria infections in humans has opened the way to an effective antimalarial vaccine that would, hopefully, prevent malaria in the vaccinated individual and block its spread; the vaccine has undergone trials, for example in Columbia.

About 12 million people suffer from leprosy. In India alone, there are about 300,000 new cases each year, and millions of Indians will require vaccination if the country is to meet its target of eliminating the disease by the year 2000. A cloned caccine alone can provide the quantities needed to eliminate leprosy altogether. Fortunately, scientists are now well on their way to genetically engineering a vaccine for leprosy. They have identified antigens on the surface of *Mycobacterium leprae* and have already cloned some of the antigens in *E.coli;* they are now in the process of determining which of these antigens would be suitable for a vaccine. (Three leprosy vaccines, two developed indigenously and one under the auspices of WHO, are already under trial in India.)

There has been significant progress on four of the five vaccines against agents that cause diarrhoea; rota-viruses which are responsible for upto 40% of the life-threatening diarrhoeas in children under 2 years of age, and to 500,000 deaths per year; *Solmonella ryphimurium*, the agent of typhoid fever; cholera; and *Shigella dysenteriae*. The rota-virus vaccine developed by Dr. Albert Kapikin of the US National Institutes of Health, is under trial in several countries, such as Finland, Venezula, and Peru. Other diseases for which vaccines based on antigens produced through genetic engineering, are being attempted and are in various stages of development and/or trial, are AIDS, influenza, meningitis, herpes, rabies, pertussis (whooping cough), measles, poliomyelitis, tuberculosis, rheumatic fever, pneumococcal infections, and the rinderpest disease of cattle. The WHO has a major action programme on vaccines.

Vaccines designed to control fertility, based on genetically engineered products such as the beta chain of the human choriogonic gonadotrophin, are also under investigation or clinical trial. With the inherent advantages of a genetically engineered vaccine, success with any one of the abovementioned vaccines will be a landmark in the history of control of disease on our planet.

Table - 1

SOME GENETICALLY ENGINEERED PROTEINS AND POLYPEPTIDES AND THEIR USES*

Name	Use(s)
Adrenocorticotropin	Inflammation
Adrenocorticotropin releasing factor	Inflammation
Albumin	Plasma expander
Angiogenin	Wound healing, tumours
Antithrombin III	Anticoagulant
α1-Antitrypsin	Anticoagulant emphysema
Apolipoprotein A1	Arteriosclerosis
Atrial natriuretic peptide	Hypertension
Calcitonin	Osteoporosis
CD4-*Pseudomonas* toxin hybrid	AIDS
Cholecystokinin	Digestion
Chorionic gonadotropin	Fertility
Collagenase inhibitor	Arthritis
Endorphin-β	Pain
Endothelial cell growth factor	Wound healing
Epidermal growth factor (urogastrone)	Burns; ulcers
Erythocyte differentiation factor	Tumours
Erythopoietin	Aplastic anaemia
Factor VII	Blood clotting
Factor VIII	Haemophilia A
Factor XIII	Surgical adhesive
Fibroblast growth factor	Wound healing; tumours
Fibronectin	Wound healing
Folicle-stimulating hormone	Infertility
Growth hormone (somatotropin)	Dwarfism; Wound healing
Growth hormone (somatotropin), bovine	Increasing milk yield (upto 25%) in cattle
Growth hormone releasing factor	Rheumatoid arthritis
Granulocyte colony stimulating factor	Leukaemia; other tumours
Granulocyte macrophage colony-stimulating factor	Anaemia; tumours
Hyaluronidase	Opthalmological infiltrations
Inhibin	Contraception
Insulin	Diabetes
Insulin-like growth factor-I (Somatomedin C)	Wound healing; bone fractures, etc.
Interferon-α1 to α21	Hairy cell leukaemia; Kaposi sarcoma; multiple Myeloma
Interferon-β	Keratitis; hepatitis B
Interferon-γ	Rhematoid arthritis; leukaemia
Interferon (consensus)	Tumours
Interleukin-1 and 2	Tumours
Interleukin-3	Leukaemia; other tumours
Interleukin-4	Leukaemia; infections
Interleukin-5	Autoimmune diseases
Interleukin-6	Leukaemia
Leuserpin 2	Blood clotting
Lipase (microbial)	Digestive disturbances
Lipomodulin (Lipocortin)	Arthritis; allergies
Luciferase (fire-fly)	Reagent; checking of contamination in water, air and beverages
Lung surfactant protein	Emphysema; pulmonary infections
Luteinizing hormone	Fertility
Lymphotoxin	Tumours
Macrophage colony-stimulating factor	Leukaemia; other tumours

Table - 1 (Contd.)

Name	Use(s)
Macrophage inhibtor factor	--
Monoclonal antibody OKT3	Transplantation
Muellerian-inhibiting substance	Ovarian tumours
Nerve growth factor	Injuries
Neuroleukin	Osteoarthritis; organ transplants
Pancreatic secretory trypsin inhibitor	--
Parathyroid hormone	Osteoporosis
Plasminogen-activator inhibitor	Blood clotting
Platelet-derived growth factor	Wound healing
Prolactin release-inhibiting factor	Fertility
Protein A (microbial)	Reagent in research and immuno technology
Protein C	Anticoagulant
Protein S	Anticoagulant
Prourokinase	Mycardial infarction; thrombosis
Relaxin	Obstetrics
Rennin	Control of blood pressure
Rennin (bovine)	Cheese-making
Somatostatin	Gastric bleeding
Streptokinase (microbial)	Myocardial infarction; thrombosis
Superoxide dismutase	After-treatment of myocardial infarction
Thaumatin (plant)	Sweetener (5000 times more effective than sugar)
Thymopoietin	Infections
Thyroid-stimulating hormone	Metabolic disorders
Tissue plasminogen activator	Myocardial infarction; embolism (dissolves blood clots; does not cause bleeding anywhere else)
Transforming growth factor-α	Wound healing
Transforming growth factor-β	Wound healing, tumours
Trypsin inhibitor	Pancreatitis
Tumour necrosis factor	Tumours
Tuna growth hormone	Increases the weight of the fish
Urokinase	Thrombosis; embolism
Uromodulin Tamm-Horsfall protein	Inflammations

* Human unless otherwise specified.

Drug Design

It has been possible to design peptides to mimic the three-dimensional structure of the active or the antigenic site of a whole protein. For example, a 14-amino acid peptide that mimicks the action of superoxide dismutase, an enzyme that neutralises free radicals that cause much to tissue deprives of blood supply, has been designed to replace superoxide dismutase in clinical use. British Biotech have similarly designed a new collagenase inhibitor, and Tom Blundell of Birbeck College in London, a pioneer in the area of knowledge-based modelling using protein databases and computer graphics, has designed a totally new inhibitor named Crystanova, of chymosin.

Drug Testing

The Bruce Ames test for testing of carcinogens or anti-carcinogens, is already widely known; it is based on mutant microorganisms, the revertants of which can easily be scored. It has now been possible to culture intractable cells such as neurons, allowing the development of an experimental, laboratory model for looking at several diseases that affect the central nervous system. Cell systems such as primary rat liver parenchymal cells in suspension, have provided a new model for testing of drugs, the development of such models might be an imperative in the years to come on account of the increased difficulty in using animals for such purposes in many parts of the world.

New Classes of Useful Compounds; the new Antibody Technology

The new antibody technology has its base in the developement of the technique of production of monoclonal anti-

bodies (MABs) by Cesar Milstein and Georges Kohler a little over ten years ago. This technology was responsible for a trunover of probably more than $ 2 billion in 1990.

One of the major applications of MABs has been - and will increasingly continue to be - in the area of diagnosis. For example, monoclonal antibodies have been recently developed that would diagnose encephalitis (by Centre for Disease Control at Atlanta and the National Institute of Virology at Poona), myocardial infarction, leprosy, and several types of cancer. For breast cancer, a MAB against c-erbB-2 cellular oncogene and another MAB against a nuclear matrix protein, have been developed. A MAB against urinary gonadotrophin peptide has been useful in diagnosis of ovarian cancer. It is not unlikely that many immunodiagnostic kits might be developed in the next decade or two for home use.

A β-glycoprotein pump on the surface of cervix cancer cells pumps out drugs that are used as anticancer agents, thus preventing the accumulation of the drug to the concentration that would be toxic to the cells; a MAB against this pump has been developed. And MAB 60.3 prevents foetal haemorrhogic shock that leads to many deaths following, for example, accidents; it has been shown to act (in monkeys) by binding to CD11/CD80 complex on polymorphonuclear neutrophilis, thus preventing their adherence to blood vessels, which adherence release substances that lead to the shock status.

One of the aesthetically most exquisite branches of biotechnology with immense application potential is antibody engineering. It has been used for site-directed mutagenesis to improve effector functions of antibodies and their affinity. It has also led to the development of hybrid antibodies, humanised antibodies, antibody conjugates, and antibody fragments that would have specific uses.

Humanised antibodies can be produced either by the combination of rodent variable and human constant regions or by grafting the antigen-binding loops of the V-domain and thus transferring the antigen-binding site from a rodent to the human antibody. A humanised antibody has been used in Cambridge, UK, to treat T-cell leukaemia.

Antibody conjugates can be used to target enzymes and toxins and as immunoadhesins, for example, for CD4 antigen through which HIV enters cells. Antibodies conjugated to magnetic beads have been used to separate foetal cells for testing them for abnormalities, and remove cancer cells from marrow. Figure 1 describes a generalised scheme for some of the steps in antibody engineering.

In addition there has been the development of peptide antigens that would replace the whole protein, and of catalytic antibodies (abzymes that show enzyme activity) that could be used to deliver low-level enzymes to specific sites.

New Strategies for Drug Delivery

One of the problems of using a modern drug has been that of ensuring that the drug reaches only the target tissue and is released slowly. Encapsulation of drugs within artificial lipid membranes, the liposomes, which can be made in such a way that they will go only to the target tissue, is one way of taking care of the above problem. Drugs that have been encapsulated in liposomes are either already undergoing clinical trials or are likely to do so in the future, are doxorubicin,

ANTIBODY ENGINEERING

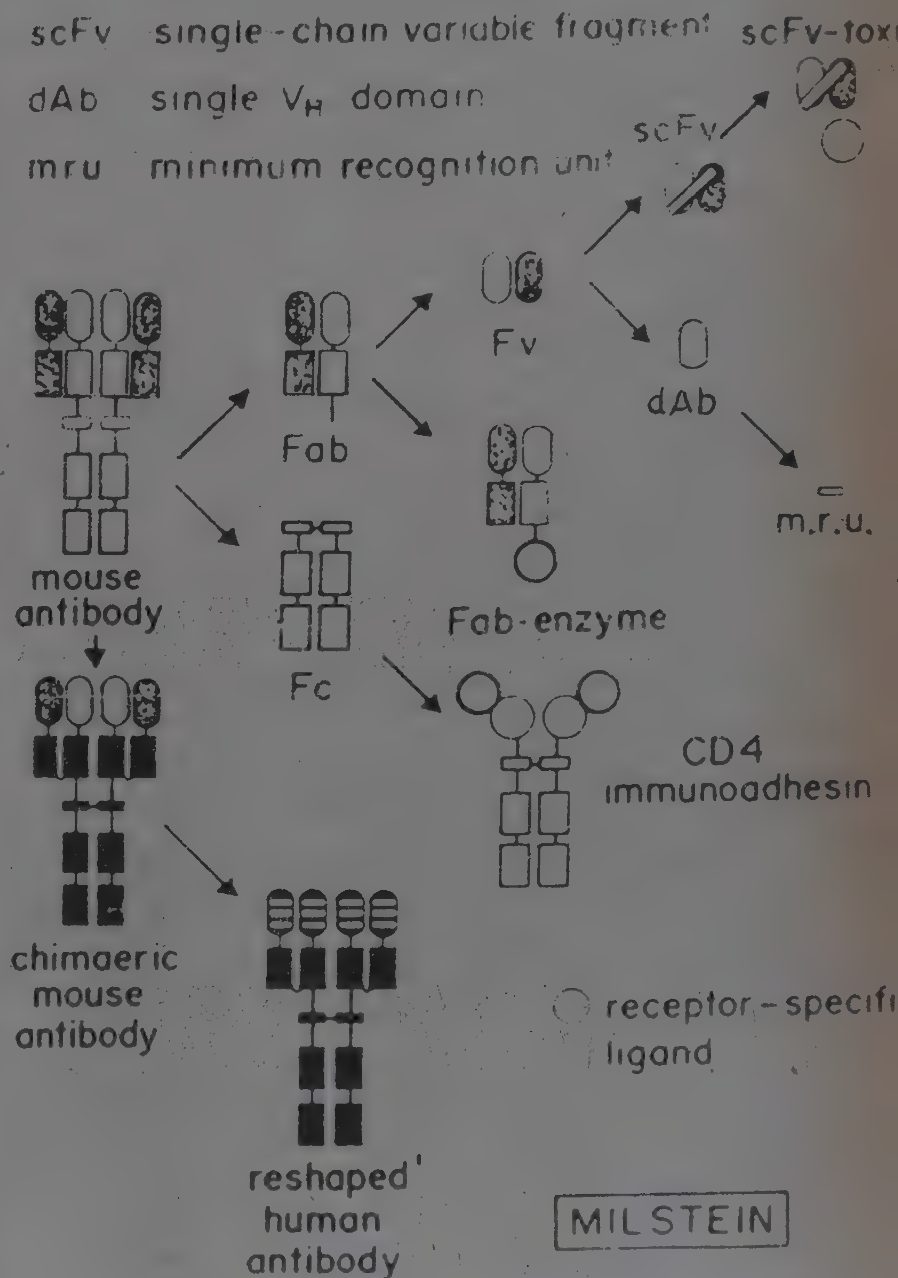

Figure 1

platinum L-NDTP, daunorubicin, and a muramyl tripeptide, all for cancer; gentamicin for Gram-negative bacterial infections; amphotericin-B and miconazole for fungal infections, insulin for diabetes; indium for tumour imaging; metaproterenol sulphate for asthma; and minoxidil for hair growth

through topical application. One of the bonuses of encapsulated drugs has been that the encapsulated drugs (for example, doxorubicin which is toxic to heart) seem to exhibit much less toxicity than the free drug.

Low-density lipoproteins have been used as carriers of drugs such as methotrexate and floxuridine, to target them into cells in which they would not otherwise enter. Peptides such as LHRH, have been used to deliver a suitably coupled anti-cancer agent to a specific site.

There is promise of the use of fused molecules as drugs that are more effective than the arithmetic sum of the constitutent molecules would be. Thus the two therapeutic cytokines, macrophage colony stimulating factor and interleukin-3, have been fused by Immunex of Seattle; the administration of the fused drug leads to an increase in the production of both platelets and WBCs; the fused drug has a higher affinity for the receptors than the individual drugs have.

The New Cures

One of the most dramatic applications of modern biology has been in regard to genetic disorders; identification of the genes involved in the known disorders, discovery of new genetic diseases, development of probes for diagnosis of these diseases even before they are clinically manifest, and their cure and management. For example, recently, genes for cystic fibrosis, neurofibromatosis (which occurs with a frequency of as much as 400 due to the high mutation rate of the gene), osteoarthritis and fascioscapulo humoral muscular dystrophy, and a gene activated by cigarette smoke, have been identified. An identification of the gene is the first step towards development of a probe for its early diagnosis, just as early diagosis is the first step towards a permanent cure.

An example of the discovery of a new genetic disorder is that of mitochondrial MERRF (myoclonic epilepsy and ragged red fibre disease) which has a defective lysine tRNA.

The pioneering work of Steven Rosenberg of the NIH in the United States has opened the way for gene therapy to cure inherited disorders. A year ago, on Friday, 14th September 1990, a billion WBCs taken out from a 4-year old girl suffering from adenosine deaminase deficiency, an inherited disorder, were treated with the normal gene and then put back in her, the girl was, when I heard last of her, reported to be doing well. He has also attempted introduction of human tumor necrosis factor gene into tumor infiltrating lymphocytes to cure, for example, melanomas, a skin cancer.

James Wilson and Richard Mulligan of the Whitehead Institute in Massachusetts, USA, have introduced the LDL receptor gene into liver cells of rat, and in a similar manner, attempted to cure Watanbe heritable hyperlipidemic rabbits. Similarly, Barton and his collaborators have attempted to cure Gaucher's disease by targetting the gene for glucocerebrosidase to macrophages.

Success has also been obtained in test-tube experiments, in correcting the cystic fibrosis defect and in conferring resistance to ultraviolet cells from Xeroderma pigmentosum patient, by transfection with normal human DNA. Injection of 200 copies of the gene for the basic myelin protein into fresh embryos has been shown to confer resistance to the neurological disease of uncontrollable shivering, convulsions and early death in several strains of mice.

In some cases, short-lived expression of a gene may be desired. Models are now available to achieve this; the gene can be fired into the cells through a microcannon. This has been done on an experimental basis for the luciferin-luciferase system.

Understanding Molecular Mechanisms underlying disease

In science, as everywhere else, understanding is the first step towards successful exploitation. The in-depth understanding that molecular biology has provided into mechanisms that underlie diseases, has laid the foundation for finding new ways and means of managing and/or curing them. For example, in the case of autoimmune diseases such as insulin-dependant diabetes mellitus, rheumatoid arthritis, psoriasis and mygasthenia gravis, one must first understand the basis of recognising self from non-self in the immune system before one can think of adequate strategies to deal with them. Immunologists are beginning to gain new insights into this recognition process.

The recently reported finding of my erstwhile colleague, Premkumar Reddy, now at Wistar Institute in Philadelphia, that multiple sclerosis may be caused by a relative of HTLV-1, may allow one to use vaccine developed to protect people from this virus. Such a vaccine is already being used in Japan to avert adult T-cell leukamia. And we have only now begun to understand the mechanism of generation variability in trypanosomes that are endemic disease-causing agents in many parts of Africa. This understanding has opened a way for meeting the challenge of this disease.

Molecular parasitology has thus come of age through the use of molecular biological techniques. Thus the sensible approach towards development of a vaccine for malaria has been to carry out molecular dissection of the malarial parasite to find out the weak points that would respond to an appropriate vaccine.

Identification to oncogenes and their cellular counterparts has brought us closer to understanding the mechanisms that underline carcinogenesis or malignant transformation, and thus brought us one step closer to finding a solution to this problem. In the case of HIV, understanding its genome organisation and the function of each of its transcroption product, has given us a basket of strategies for development of anti-HIV agents.

Understanding the Molecular basis of the action of known drugs

Use of relatively new technique of photoaccoustics spectroscopy has allowed us to understand the mechanism by which chloroquine kills a malarial parasite, and precisely what happens in the process of chloroquine resistance. This knowledge could be used to design agents that could be effective on chloroquine-resistant parasites. Identification of receptors of pain killers such as morphine, led to the discovery of endorphins; and development of the abortificant RU 486 is considered to be a milestone in population control as it discourages the fertilised egg from fastening properly to the uterine wall.

Prediction of genetic susceptibility or likelihood of having a disease much before its onset

The increasing availability of probes for genetic diseases would make such a prediction possible routinely. In the case of type 1 diabetes in which insulin-producing cells are attacked, one can detect antibodies to pancreatic cells much before the onset of disease; this may make it possible to treat potential diabetics with an anti-rejection drug less toxic than cyclosporin.

The case of seminalplasmin

Seminalplasmin in a bovine seminal plasma protein that was discovered by us in the late 1970s as a transcription-inhibitory and antimicrobial agent. Since then, the work of our group and of several others, has shown that this protein exhibits a large number of distinct biochemical and biological effects in addition to those mentioned above. It inhibits calmodulin activity by binding to it, and has a DNA-unwinding activity. It is a potent inhibitor of calcium transport and of motility in spermatozoa, of the acrosome reaction and of in *vitro* fertilisation. Seminalplasma was also observed by us some years ago to be a potent inhibitor of reverse transcriptases. We recently noticed that it has some sequence homology to the CD 4 antigen, and appears to exist largely as a amphipathic helix. On the basis of these considerations, we felt that it may act an anti-HIV agent, We have now shown, using three different methods of assay — protection of human peripheral lymphocytes against lysis by HIV, release of HIV as measured by increase in the P 24 protein using an ELISA in the supernatant of the culture medium when the above-mentioned cells were infected by HIV, and the syncytium formation assay. Seminalplasmin has been found to be a highly potent anti-HIV agent in all these assays. We have also shown, using FACS analysis, that seminalplasmin can pull off the virus already bound to the cells, in addition to preventing the entry of the virus into the cells. Animal pharmacology experiments on seminalplasmin are now underway under the auspices of the Indian Council of Medical Research.

FUTURE

In the years to come, genetic engineering, immunotechnology and tissue culture will act as prime determinants of many aspects of medical and health care. Proteins of pharmaceutical importance made by modern biotechnologies such as those mentioned above, are produced by more than 175 companies in a least 18 countries of the world today. This number will certainly increase, and India would be added shortly to this list.

Probably, more than 5,000 drugs derived from plant sources appear to have been in use around the world in indigenous systems of medicine, for a vary considerable time. While it is certain that not all of them are probably truly effective, it is very likely that some of them would be found to be effective when tested using modern techniques; this is bound to be done in the years to come. A country like Vietnam already has a number of such drugs included in their pharmacopia, the selection having been based on empirical considerations; these drugs are grown, prescribed and used in all primary health centres in Vietnam.

Human DNA fingerprinting, when it becomes a routine matter of documentation of one's identity, will lead to the discovery of new genetic disorders.

Availability of human genome sequences will lead to new rules and generalisation about health and disease and thus to new insights into them; it would also allow identification and quantification of susceptibilities to various diseases, thus helping laying out scenarios for the future of a particular individual.

The techniques of sexing or choosing the sex of the progeny will become commercially available on a much larger scale than today, and will be widely used.

But, this all will not be unadulterated pleasure. There would, of course, be the question of dealing with contaminants of a new kind - for example, contamination of genetically engineered proteins desired to be used in humans, by proteins of the organism in which they were produced. But there would also be social, economic, moral, ethical, legal and political problems that we will need to face. For example, in India where there is a premium on the male child, and

certain groups even practise female infanticide inspite of the fact that it is against the law, shall we permit people to choose the sex of their progeny.?

CONCLUDING REMARKS

Finally, a word about justification for this talk that the organisers have arranged in their wisdom in this conference on applied microbiology, for much of what I have said may not seem to have a direct relationship with microbiology of any kind - leave aside the applied variety. But, in fact, there are hidden relationships! Genetic engineering, including production of antigens for vaccines, often uses microbes, as does the Bruce Ames test for carcinogens. Microbes are likely to be used in the future, perhaps commercially, for production of antibodies through phases in which the H and L chains of immunoglobin have been cloned.

Many of the diseases against which strategies would be directed using modern biology in the coming years, are caused by microbes including viruses. And, lastly, just as what is true for *E. coli*, is true also for an elephant (*a la* Jacques Monod), we are now beginning to discover that much of what holds true for an elephant can be made to hold true for *E.coli*. It just depends on how clever we are. So let us hope we are going to be very clever - and very responsible!

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Industrial Opportunities in Biotechnology*

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I feel deeply honoured to have been asked to deliver the prestigious N.R. Kamath Memorial Lecture for this year by the Indian Institute of Chemical Engineers. While I may have some experience with Pharmaceuticals and biologicals in the areas of R&D and manufacture, I can have no claim whatsoever in the important field of Chemical Engineering. I would attempt to place before you some features of the biotechnology developments and its implications to the concerned industry.

At the outset, I would like to pay my respects to the memory of late Prof. B. Jagannadhaswamy, former Director of Alagappa College of Technology and elected President of IICE for the year 90-91. We miss his erudite and gentle personality and this loss is felt deeply by all of you.

There is an increasingly accepted belief that waves of innovations have occurred more or less regularly over the past 250 years in roughly 50 year cycles. The first few years in the cycle see a build up of new technological potential, followed by a period during which new and far reaching innovations burst on the scene. Then, things gradually slow down during the period of commercialisation. This idea was first proposed by a Russian economist — Nikolai Kondratiev. A German economist, Joseph Schumpeter, picked up the idea in the 1930s and showed that the first wave lasted from 1790 till 1840 and was based largely on new technologies in the textile industry, which exploited the potential of coal and steam power. The second wave took place between 1840 and 1890 and drew directly on the development of railways and the mechanization of production. The third (1890-1940) wave was based on electric power, advances in chemistry and the internal combustion engine. The fourth wave (1940-1990) was based on electronics, but the pace of innovations may not pause the way it did between the previous cycles. Christopher Freeman, professor of science policy at Sussex University in England, thinks that biotechnology could be at least part of the basis of a fifth kondrative wave, which may have already started. Advances in physics and mathematics underlie computer science, would add another key element to the fifth wave.

Biotechnology is listed as the third of the three great technological revolutions of this Century, the first two being Atomic energy and Computer technologies. While biotechnology is considered by many as the continuum of the use of biological systems for useful purposes of mankind, it is only with the advent of the recent advances in recombinant DNA technology that focussed attention of the great possibilities of the technology in various applications. These include human and animal health, agriculture, aquaculture and animal husbandry practices, production of value added chemicals, mineral leaching, electronics and environmental control. Like the other two technological revolutions, modern biotechnology is also founded on intricate and finer science base deriving lateral supports from the areas of molecular biology, molecular immunology, protein engineering, crystallography, engineering science, electronics and instrumentation.

There has been divergent speculation of the expectation from future developments in biotechnology. There is however unanimity that the pharmaceutical sector shall grow at the fastest rate, capturing substantial share within a decade. Table 1 would illustrate the growth forecast for various biotechnology products by one group (1). The main reasons are that the industry has already been practicing the conventional biotechnology for several decades and there already exists sound infrastructural and professional knowledge in microbiology and down stream processing capabilities much of which shall provide substantial lateral support to biotechnological innovations, adaptations and applications.

Biotechnology is the technology of the future and it is multi-disciplinary. Pathfinders in biotechnology have successfully synergized biology stream and the supporting technology. This conference, I presume will highlight the need for each other! India had wisely invested in developing the manpower and infrastructural facilities in biotechnology and today we are beginning to see some success. While the development in biological sciences is far ahead in this field in our country, I am afraid that our development in technology is not very well advanced in this area, mainly on account of improper coordination. Hence I attach great importance to the meeting of this sort, where the chemical engineers have decided to take a serious look at a global perspective. The industries in India have also to make a vigorous change in their attitude and bring the achievements in our laboratories to commercial profitability and more than that, to make available these modern biologicals to our people. Especially when the need of the large population is quite different from that of developed countries, it is often that we have to develop our own product lines.

From the euphoric promises of the early 80s to the disappointing performance in the mid and late 80's, the present trend is most encouraging. Complementary mergers between

* Prof. N.R. Kamath Memorial Lecture—1991, delivered at the Indian Chemical Engineering Congress, 1991 at Madras.

Table - 1

WORLD-WIDE MARKET VOLUMES FOR PRODUCTS FROM NEW BIOTECHNOLOGIES (1985-90)

(In billions US$ - Basis: '985)

	1985	1990	1995	2000
Pharmaceutics	1.25	3.75	11.88	30.00
Agriculture	0.00	0.625	2.50	6.2
Food & Feed	2.50	2.50	5.00	8.75
Chemicals	0.00	0.00	0.625	0.625
Energy	0.00	0.00	0.00	0.00
Waste Treatment	0.00	0.625	1.87	2.50
Equipment & Engineering	1.88	2.50	5.00	5.00

biotech companies as well as takeover of some of the smaller biotech firms by larger industrial houses have led to better performances. This is reflected in Ernst Young's sixth annual survey of U.S. biotechnology entitled "Biotech 92; Promise to reality. (Table 2).

Table - 2

U.S. PUBLIC BIOTECH COMPANIES
(Aggregate Data in millions)

	This year	Last Year	% Change
Net loss	809	442	83
Revenues	3,783	3,078	23
Sales	2,855	2,264	26
Royalties	73	41	76
Research	1,322	1,124	18
Contracts	497	490	1

The organizational structure of several industries is also likely to undergo change with increasing penetration of biotechnology. In some of the developed countries, the traditional family run concerns are giving way to big-league operators like Monsanto, Upjohn, etc. through acquisitions and mergers. The driving force behind the acquisitions is a growing feeling among scientists that we are on the verge of a second "green revolution".

Some feel that biotechnology is a logical extension of the chemical industry. Fundamentally, however, the chemical industry and the biochemical industries are quite different. In the traditional chemical industry the rule of thumb is that, when designing a plant and working out its economics, the bigger the better. Traditional chemical plants are not only huge but custom built. They need engineers knowledgeable in handling reactions at high temperatures and also on how to carry out complex control steps in huge vessels and to build and transport these vessels from the fabrication areas to sites. On the other hand, microbial processes are done at ambient temperatures, near normal pressures and neutral aqueous media, but requires biological purity (no unwanted microbes floating around!) and very gentle handling of the fluids inside them. These are requirements for a biochemical facility, where bugs do the work. In biochemical plants, bigger does not necessarily mean better, because it is much harder to handle large volumes of bugs than small ones. So the tricks of the trade that made an engineer usually productive in the chemical business are not necessarily going to sustain him in the bio chemical industry frequently referred to as the biotechnology industry. The traditional Chemical Engineer has spent his career learning how to save energy while handling reactions at high temperatures. What is now needed is a knowledge of sophisticated equipment design and process controls with a sound knowledge of microbiology.

The end products of biotechnology based industries are:

1. *Large Volume, low value products:*

a) Biomass (Single cell protein, Biopesticides, Biofertilizers, etc.)
b) Metabolic products (Antibiotics, enzymes, etc.)
c) Bioconversions (Chiral compounds, steroid conversion etc.)
d) Transgenic plants and animals.

2. *Small volume, high value products:*

a) recombinant DNA based Health care products (Insulin, Interferon, TPA)
b) Animal and plant tissue culture products (Monoclonal antibodies, growth factors, alkaloids, etc.)
c) Recombinant antibodies
d) Biosensors.

The application of chemical engineering principles in both the systems is evident and the recent innovations in this technology is phenomenal. Process control and automation in Biotechnology is a lot more demanding than chemical production as the signal outputs of bioprocess systems have to be closely monitored and input made very rapidly to prevent the damage

to the living systems. This area is witnessing major changes with Flow Injection Analyzers coupled to biosensors. Automation has also undergone vast changes with computer based control and AI expert systems for data management.

In large volume chemical industries bioprocess alternatives have become available (as shown in Table-3).

The discovery and fast development of recombinant DNA technology has enabled better understanding of the molecular basis of life. It has allowed the production of bioactive molecules which were previously either scarcely available at very high costs or were not available at all. Currently less than a dozen of such molecules for use in humans have been approved for marketing in different parts of the world (2-4) as indicated in Table-4. These include insulin, interleukins, interferons, hepatitis B surface antigen (as vaccine against Hepatitis B), erythropoietin, human growth factor, tPA, and streptokinase. More than a hundred other compounds are at various stages of development. The decade of 1990s shall see phenomenal growth of such products entering into the market.

A range of cell lines and microorganisms have been used as the hosts for the application of recombinant DNA technology. These shall be expanded and many more shall be added to this range. Currently among the microorganisms most commonly used as hosts is *E.coli*, as much is studied and understood about its genetic system. Moreover the bacterium has faster metabolic and reproductive rates — about 20,000 times faster duplication rates than man. These would imply faster production and productivity rates of desired products (desired proteins), if the organism is properly modified. Other organisms also having substantially higher reproductive rates and having other advantages like secreting the desired protein (in some cases) have been used in recombinant DNA manipulations. These include Yeasts, Bacillus subtilis, Streptomyces etc. A large no. of cell lines of mammalian and other origin are also being used. These include CHO, BHK, Insect cells, mouse myeloma, mouse hybridomas etc.

The productivity of genetically transformed cells is much higher compared to the natural ones. The following Table 5 would cite the difference.

Engineered proteins in *E.coli* or other organisms are mostly in the inclusion bodies and need to be solublished by various methods (9). In order to facilitate isolation recombinant proteins several new techniques for the purification of pro-

Table - 3

AVAILABLE BIOPROCESS ALTERNATIVES

Chemical	Current Process	Volume $ million	Facilitating microbe
Acetic acid	Oxdn, acetaldehyde	800	Acetobacter
Acetone	Oxdn, cumene	500	Clostridium
Butanol	Redn, Butanol	300	Clostridium
Ethanol	Hydration ethylene	100	Saccharomyces

Table - 4

RECOMBINANT DNA BASED PROTEINS CURRENTLY IN HUMAN USE (IN-VIVO)

Protein	Main uses	recombinant DNA sources
Insulin	Diabeties	*E.coli* and yeast
Human growth hormone	Dwarfism	Mouse mammary cells
Interferons	Viral disease, Cancer and AIDS	*E.coli*
Interleukins	Various cancers	*E.coli*
Tissue plasminogen activators	Thrombolysis	CHO cells
Erythropoitin	Anaemia	CHO cells
Bovine growth hormone	Increase in milk production	*E.coli*
Hepatitis B. surface antigen	Vaccine against Hepatitis B.	Yeast

Table - 5

COMPARATIVE PRODUCTION OF PROTEIN IN NORMAL AND TRANSFORMED CELL LINES

Products in culture	Types of cells	Productivity	References
Tissue plasminogen activator cells	Human melanoma	0.2 mg/l	5
	Engineered myeloma cells	55 mg/l	6
Interferon	Normal human fibroblast	4×10^7 u/1	7
	Engineered CHO	10^{10} u/1	8

teins have emerged. This was specifically necessary because the quantities of such recombinant proteins present either as inclusion bodies or in the periplasm of microorganisms or in the cell soup were in very small quantities compared to the conventional microbial metabolites as indicated below in Table 6.

Table - 6
TYPICAL PRODUCT CONCENTRATIONS

Products	Concentration
Ethanol (11)	50-120 g/l
Organic acids (11) (Lactic, Citric, etc.)	40-100 g/l
Antibiotics	
Penicillin (12)	12-40 g/l
Tetracycline (12)	18-50 g/l
Gentamycin (12)	0.6-2.5 g/l
Vitamins B-2 (11)	10-15 g/l
Vitamins B-12 (11)	20-60 mg/l
TPA (16)	55 mg/l
Human growth hormone (13)	20.5 mg/l
Human chorionic Gonadotropin (14)	1.1 mg/l

However, the underlying principles of telescoping the production strategies are in the area of recombinant DNA and protein engineering. The application of molecular methods to tailor the proteins to enable them for successful down stream recovery and purification is the key to the success of these operations. Some of the interesting routes are:-

(1) Cloning of the relevant genes in expression vectors for over production of the products (10-30% of the cell prot-teins), to enable a greater ease of purification. Often these products end up as inclusion bodies and can be separated by differential centrifugation with high purity of the samples recovered. However, solubilizing the proteins and folding back to their original configuration can be difficult.

(2) Molecular links to facilitate easy recovery of the desired proteins through affinity columns.

The ability to design purification steps based on properties of fusion proteins has proved to be a powerful approach for protein separations. Usually in a one step purification the desired product is separated from other products and affinity tail is later cleaved. The principle of this approach is shown below:-

!!!!!!!!!!!! xxxxxxxxxx 2HN ———— Product

Affinity Tail   Cleavage sequences
Elusion and cleavage

!!!!!!!!!!!! xxxxxxxxxx + 2HN ———— Product

The recombinant DNA technology has led to a need for the development of reliable and efficient manufacturing processes. The first factor is to have an efficient host which may be a miroorganism or a transformed cell line. Depending upon the host will the selection or design of the bioreactors be made. For growing *E.coli* or yeasts the stirred tanks would usually be the best choice and several commercial variations are already available from leading companies. Usually the batch mode of fed batch mode or preferred for growths. Transformed continuous cell lines like CHO, BHK, hybridomas etc. can be grown in suspension while the human diploid fibroblast cells are usually anchorage dependent for growths. Certain continuous cell likes like the verocells grow in suspensions as well as attached to surfaces. For continuous cell lines suspension culture is usually preferred as this is simpler and this enables precise monitoring.

Insertion of DNA sequences that facilitate secretion of the protein in a relatively protein-free medium for the facilitation of purification would be commonly used in large scale. For soluble products the trend in *E.coli* is to secrete the products into periplasmic membrane, by the attachment of leader sequences (OmpA, Beta lactamase alkaline phosphatase). For Bacillus species it is to secrete the product out of the cell by the use of leader sequences of neutral or alkaline proteases, amylases etc. Ideal cloning strategies the following features: (See next page)

Table - 7
DIFFERENT TYPES OF PROTEIN FUSIONS USED FOR PRODUCT PURIFICATION

Affinity handle	Product	Ligand	Cleavage System
Protein A	IGFI	IgG	Factor Xa
Protein G	IGFI	IgG/hSA	Factor Xa
Poly Arg	Urogastrone	Ionexchange	Carboxypeptidase
Poly His	HiV Tat	Metal affinity	Carboxypeptidase
Poly Glu	hGH	Ionexchange	Dipeptidyl aminopeptidase
'Flag' peptide (nh2A-B-CEtc-Product)	GMCSF	mAB	Enterokinase

(Source: TIBTECH, Jan. 1991)

Gene : ______________________

P RBS Leader Product

Product C. Terminal

p-Promoter, RBS-Ribosome binding site.

Transcription

Translation

↓

Secretion

2HN ______________________

↓

Signal Peptide

2HN______________________COOH

Exported Product

In order to facilitate the isolation and purification of desired protein expressed in specific cell lines, polycistrons have been constructed by the molecular biologists by adding DNA for additional peptides to either the 5' or 3' end of the target gene. In many cases, genes coding for an entire enzyme is fused to the target gene. The expression of the polycistron results in a fusion protein consisting of the desired protein and a purification tag. After isolation and purification of the heterologus protein the unwanted portion can be cleaned up by enzymatic or chemical processes. Several purification tags have been used (15) and many more will be found in future. Removal of the purification tags and purification of the desired protein to the required levels in scales adequately large to warrant commercial production will primarily be the domain of the chemical engineers.

The concentration of bioproducts are usually in milligram quantites or less per litre of the fermented broth and the products are either available in the supernatant or within the cells as inclusion bodies. These would thus require special processing for recovery, quite different from the conventional fermentation products. The future development of biotechnology is thus greatly linked with development of efficient down-stream processing systems and this is a great challenge to the engineers specially the chemical engineers, and the instrumentation specialists for enabling to produce gms or kilograms quantities of such high value added products. This can happen only by concerted effort and team work among people of multidisciplinary background, the molecular biologists and the chemical engineers being the main players interwoven with people of other disciplines.

Growing of different kinds of host cells would require different optimum conditions. In large scale processes with all types of host cells the control of pH, temperature, dissolved oxygen and certain nutrients would be required. The vessel sizes would usually vary between 100 lit. to 10,000 lit. unlike the conventional fermentation tanks which can be as large as 250,000 lit. but is usually around 100,000-150,000 lit.

While touching upon the applications of chemical engineering, the types of bioreactors that are currently available for recombinant DNA based products and their features are listed in Table 8 below.

These strategies are essential for an economic recovery of pure (99.999%) products demanded in the human reagents. The major cost of biological products is attributable to the tedious and time consuming separation processes such as column chromatography, piphasic separations, membrane separation etc. Again the above strategies have been invaluable in cutting down the number of unit operations in these steps and resulting in greater purity of the compounds.

As has been indicated in Table-5, the concentration of recombinant proteins after fermentation is very low. The process therefore has to be different from conventional once and requires careful manipulation. As the products are not usually found in the supernatant but within the cells, the latter need to be handled very carefully to take out the targeted protein. Usually the cells are disrupted by treatment with alkali, detergents or enzymes, or are subjected to shear (liquid or solid shear) abrasion or osmotic shock. The cell-debris are separated subsequently by centrifugation or other mass separation techniques. The filtrate containing the product is subjected to nuclease treatment and the proteins are then precipitated by salts or solvents along with pH alteration wherever applicable. This enables partial purification only. The precipitate is redissolved, subjected to enzyme or chemical treatment for cleaning the unwanted portions if any and allowed either to precipitation or to aqueous two phase extraction or chromatography followed by freeze drying, depending

Table - 8

TYPES OF BIOREACTORS CURRENTLY AVAILABLE FOR RECOMBINANT DNA BASED PRODUCTS

Type	Operation	Scale-up	Productivity
1. Stirred tank	Simple	Yes	Low
2. Airlift Batch	Simple	Yes	Low
3. Hollow Fiber	Complex	--	High
4. Ceramic Matrix	Complex	Yes	Intermediate
5. Fluidized bed	Complex		High
6. Membrane	Complex		High
7. STR/Airlift with membrane/perfusion	Complex	Yes	High

upon the extent of purification sought. Injectable biologically active human proteins like insulin, erythropoietin, growth hormone, interleukins, interferon, hepatitis-B surface antigen etc. require intricate purification and processing; the industrial procedures of such processes are not published. It has been possible to purify many of these proteins by affinity chromatography using monoclonal antibodies as has been seen from the published literature as indicated below (Table-9).

Table - 9

PROTEIN SUBSTANCES PURIFIED USING MONOCLONAL ANTIBODY COLUMNS

Protein Substances	References
Tissue plasminogen activator	16
Urokinase	17
Alpha Interferon	18
Beta Interferon	19
Interleukin 2	20
Blood factor VIII c	21
Prolactin	22

When Genentech (San Francisco) started the production of tPA in 1982, the concentration for each dose was expected to be 1 mg. But when it turned out that one needs 100 mg/dose, it switched from *E.coli* to CHO cell lines and the consequent bioreactor changes along with downstream steps of purification that led to 100 fold lowering of the costs. The key to the steps of cutting production costs is the down stream processing. This is often more than 50% of the total production costs. Often one has to purify 0.1 g/l of product in a total volume of 1000 lit. The development of membrane filtration system (perfusion chromatography, Hollow fiber, tangential and radial flow systems etc.) have contributed to the cost effectiveness of the operations. Some data on these is presented below:-

	Axial Flow Column	Radial Flow Column
Flow rate	25 l/h	75-95 l/h
Production rate	350 1/3 shifts	350 l/shift
Column size	161	201

These are scalable to process levels of 2-3 kl. Some of the important biologicals that have been successfully commercialised are:-

Trade Name	Firm	Treatment
Humilin (Insulin)	Eli Lilly	Diabetes
Activase (tPA)	Genentech	Acute Myocardial infarction
Protropin (GH)	Genentech	Growth deficiency
Recombivax (HbSB)	Merck	Hepatitis
Intron A (Inf-a)	Schering Plough	Haoru Cell Leukemia Keposi's sarcoma
Monoclate	Armour	Hemophilia

The recent excitement is on the possibility of producing vaccines and diagnostic monoclonal antibodies in *E.coli*(10) This opens up the possibility of employing the conventional infra structures for their production, as these are in large scale demand and the use of Eukaryotic cell systems are expensive and cumbersome. The underlying principle is that the hypervariable region of the antibody molecule can be cloned and this confers the specificity of the antigen-antibody recognition. Coupled to the gene expression, other strategies outlined above can be employed to overproduce these compounds.

What are the major demands of a successful and cost effective down stream processing? 1. Cost 2. Sterile operations and stable end products 3. Adequate containment in the case of recombinant DNA based products 4. Retention of full biological activity with very little contaminants. If one looks at the cost of the end products, they are inversely proportional to the molecular weight.

Having laid the framework for the growth of the biotechnology industries, let us now look at the opportunities that exist particularly in the downstream part. World wide the annual market for downstream processing equipment is about one billion dollars. Sales have grown at a 20% rate over the past decade and this growth should continue through 1995, when the market is expected to reach 2.5 billion dollars. Liquid chromatography and membrane filtration process account for 90% of sales. Gel filtration and ion-filtration techniques still dominate chromotographic separations while microfiltration systems account for over half of all membrane filtration separations.

Let me outline some of the success that we have had in India in the area of large volume bioprocess technology. As you are aware we have established substantial capacities in the production of industrial alcohol. A genetically improved strain capable of tolerating high initial sugar concentration in the fermentation broth and production of higher levels of ethonol in the wash has been developed at IMTECH in Chandigarh. Large scale fermentation studies have been conducted in working volumes in fermenters upto 3.7 Kl capacity. An industry has been identified for carrying out commercial scale trials using the strain as well as for process development. The initial sugar concentration of 26.5% with the new strain compares with the initial maximum sugar concentration of about 15% in most of the Indian distilleries today. The impact of this on the downstream portion of the plant is quite obvious. The plant size would be substantially smaller for a new plant using the new strain. Alternatively, much more could be produced from existing production facilities with the use of the new strains.

Process optimization for the production of Biopesticides,

that are attractive alternatives to polluting chemical insecticides have been carried out at the Centre for Biotechnology at Anna University, These pesticides, one capable of control of mosquitos and other the agricultural insect pests have to compete with chemicals in terms of cost and obviously strain development, bioprocess optimization and automation of the process to maintain rigorous quality control are essential. Currently this process is also under the umbrella of Industrial Development and will represent a wholly indigenous technology.

The other important industry in which significant exports have taken place is the leather industry. Several developments in biotechnology applications have taken place in this industry. To name just two, CLRI the premier national leather institute has developed a biotechnological enzymatic method of unhairing animal skin. The indigenously developed product "clarizyme" has been found to be extremely good on sheep and goat skin and is now being tried on thicker skins like that of the cow. It is reported that this is more cost effective and comparable to the traditional lime and sulphide processes. The quality of the leather is also better. In the other area, waste management, efforts are being made to develop several "prototypes" of microbial degradation systems for cleaning of the leather tannery effluents. The use of proper instrumentation in monitoring the quality of effluents cannot be over emphasised and new tools like bio-sensors have a significant role to play.

Concluding remarks:

The decade of 1990s shall see the introduction of several life saving bioactive proteins to be used in human therapy. These shall be produced in unnatural hosts by recombinant DNA technology as production in natural hosts would be slow and expensive. While the molecular biologists will contribute significantly towards the upstream of the production technology by choosing host cells and appropriately modifying them, the microbiologists along with the chemical engineers and chemical technologists shall provide support for optimising process parameters and designing appropriate bioreactors while the chemical engineers along with the instrumentation specialists, the protein chemists, the analytical chemists and others shall be instrumental to the final isolation, purification, packaging and product delivery to the medical profession and the consumers. It would not be possible to work in isolation by any specialist group. It would be the right kind of people working together with proper equipment and instrumentation support, all interwoven together into a complex and smooth fabric to have realizable benefits for the individuals as well as for the society.

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Strategies for quantum jump in export of leather products*

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Introduction

Indian leather industry occupies a position of prominance in the economy, characterised by its potential for employment growth and exports. The industry has been identified as a thrust sector for exports. The production and export performance of the industry during post-independence period has been not only commendable but also stands out as an example for similar industries. The industry has grown at a phenomenal rate during the last decade, particularly in the Seventh Plan period. It is estimated that the value of the Indian leather industry which was in the order of Rs. 1670 crores in 1984-85 had reached to a level of Rs. 4000 crores in 1989-90 thus registering an increase of 28% per annum as against the fixed target rate of 19%. Similarly, the export of leather and leather products registered a sharp increase from Rs. 584 crores to Rs. 1800 crores during the same period and thus registering an annual growth of 42%. With the present value of exports from the country, leather exports are ranked fourth among the commodities exported from India.

India's leather industry has been able to achieve a position of status because of certain factors such as strong livestock base, consequently resulting in the substantial availability of hides and skins, availability of labour both skilled and unskilled, comparatively at lower wages, adaptability of the industry to the changes both at national and international levels, availability of a good export surplus due to lower indigenous demands for leather/leather products, less stringent pollution restrictions, importance of export sector in national economy, liberal Government incentives and above all a clear understanding between the government and the industry. Considering the earlier performance of the industry, higher targets to the tune of Rs. 3452 crores, originally fixed for the Eighth Plan period, are further enhanced to Rs. 6,300 crores and so also the industry is expected to achieve an export target of Rs. 10,000 crores by the end of the present century. These targets have been set taking into account the market for leather products at global level trade and a possible increase in the share of India's leather products in the global leather trade. Typically the share of Indian closed footwear in the global trade accounts to only 0.5%. An increase of the market share to 5% will represent a quantum jump in the exchange products of Indian leather sector. In order to achieve a quantum jump in the share of India's leather sector in the global trade, there is a need to examine the strengths and weaknesses of the industry and evolve a suitable strategy for the future. It seems meaningful to consider various strategic measures needed in further strengthening the raw material base (in this case leather and non-leather product components), technologies for product sector, managerial capability development, skilled manpower development, financial resourcing, marketing and development of new markets and government policy inputs.

International Scenario

The international scenario is fast changing both politically and economically. The political map of the world, more particularly, Europe is undergoing drastic changes. While the Western Europe is coming closer by organising themselves into a single economic block in the name and style of European Economic Community (EEC), the Eastern Europe is getting disintegrated at a faster rate. A new world order has emerged in the erstwhile USSR with the emergence of the Commonwealth. The Centrally Planned Economy countries are gradually moving towards market economies. Suddenly readjustments in industrial wages in Europe have been made and leather products sector in the western countries may not find an adverse industrial climate. As such, India's exports of leather and leather products to Western (49.7%) and to Eastern Europe (21.6%) are considerable. The developments that are taking place in Europe are bound to have their repurcussions on India's exports. This paper is intended to identify the market strategies for enhancing India's exports of leather products in the changing world scenario and to identify possible measures that are needed to maintain the sustained growth of Indian leather and leather products exports.

Material base for Leather Products Sector

The material inputs for leather products sector could be used finished leather, non-leather materials including accessories, speciality chemicals etc. The major and vital input is leather. In this regard, India has an inherent advantage. One of the strengths of Indian leather industry is its strong raw material base. With a projected stock of 208.5 million cattle, 89.1 million buffaloes and 128.9 million goats, India is ranked first among the livestock holding countries of the world and possessing 56.3 million sheep, the country is placed in the sixth position. With off-take rates of 11.6% for cattle, 23.3%

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buffalo, 67.8% goats and 62% sheep, India produces about 43.27 million hides and 139.26 million skins.

There are, however, some basic changes in the country in the rearing, breeding and utilisation of livestock. The priorities in Indian livestock is fast changing. Due to the changing priorities in the rearing of animals, the overall growth among the cattle stock will be either stagnant or may maintain the present growth level of 0.5%. Compared to cattle population, buffalo population is likely to make modest improvement (1.7% annual growth) in the overall stock. Even in buffalo population too, the cross-breed is gradually gaining importance because of higher output of milk. Breeders feel that with less number of animals, they can have better returns in the case of cross-breeds. As a result, the average number of holdings is gradually coming down, resulting in overall stock depletion. Among the four important major species of livestock, it is goat that has been maintaining faster growth (2.7%) despite various restrictions on goat farming Similarly, sheep population is another specie which is registering an upward trend over the years with growth rate of 0.9% per annum. However, due to ever increasing demand for goat and sheep meat, there is a lot of pressure on these two species resultng in the indiscriminate slaughter of young and productive animals. This phenomenon causes heavy inroads into the reserves. All these factors will naturally contribute in arresting faster growth rate of animals causing downward trend among the overall stocks. Estimates for livestock as well as availability of hides and skins from 1990-91 to 2000 are listed in Table 1.

As the leather and products industry is fast developing there is a greater demand for more raw hides/skins. Unfortunately, with slow growth rate of livestock the industry may not be able to meet the entire demand of hides and skins from local supplies and they have to be supplemented by way of imports. To enance the present stock position and maintain reasonable growth trends there is a need to provide certain incentives to the primary breeders.

The strength of Indian units is not only from the exhaustive animal wealth, but also from the capacity to convert raw hides/skins into intermediate quality finished leather. In this regard it is appropriate to review the extent of capacity utilisation in Indian tanning capacities more freely.

There are 1083 tanneries in India, of which 1008 are in SSI and the rest 75 in DGTD sector. The combined installed capacity is for processing 62.5 million hides (1428 million sq.ft.) and 161.34 million skins (807 million sq.ft.) This amounts to a total processing capacity of 2235 million sq.ft. In addition, the unorganised tanning sector processes about 10% of the available hides and skins. As against the installed capacity in DGTD and SSI sectors, the actual utilisation is only 61% in case of hides and 66% in case of skins, accounting for an overall utilisation of 63%. Table III indicates the total installed capacity and its utilisation in different sectors of the industry.

It can be seen from the table that the capacity utilisation in skin based tanneries (66%) is comparatively better than the hide based tanneries (61%). It is also observed that the processing capacities are comparatively better utilised in organised sector (68%) than in SSI sector (62%). As such there is adequate capacity to process hides and skins but an additional capacity for 42 million pieces is required for processing skins by 1994-95. Similarly, the capacity requirement for hide by the end of Eighth plan period would be 1385 million sq.ft. With the 4 million pieces additional capacity that has been already approved, the total capacity will be 1520 million sq.ft. by 1994-95.

It is anticipated that the leather processing industry is likely to confront a problem of basic raw material by the middle of Eighth Plan period and will get further aggravated by the end of the plan period unless adequate measures are taken well in advance.

Taking into account the existing scenario both at national and international level, although as such there is enough capacity for processing hides and skins in the country, there is a need to create further capacities on a selected basis during the 8th Plan period. The additional capacities are expected to go in for the processing of quality finished leather on par with international standards, reduce the regional imbalances in leather processing in the country, provide access to the latest machinery and technology and also pave the way for joint ventures.

One of the major weaknesses of the Indian leather sector with respect to the export trade on leather products is the lack of adequate development of infrastructural support from the non-leather components industry. Typically in the case of footwear sector, a strong infrastructural support from component and accessories industry is essential.

PATTERN OF EXPORT OF INDIAN LEATHER SECTOR

Current Trends and Need for Changes

Initially in the early 1940's the exports were confined to the export of raw hides and skins from the Indian leather sector. One of the first measures initiated by the Government to promote the export of finished leather was restricting the exports of raw materials in favour of semi-tanned exports and in seventies measures were initiated in favour of finished leathers discouraging the exports of semi-tanned leathers. As a result of these measures, the Indian leather industry has made rapid strides on the export front. The direc-

tion of further change is towards the conversion and export of value added products. Whereas the exports of raw hides/skins dominated in the sixties, in seventies with semi-tanned leathers, in eighties finished leathers, in the nineties the exports of value added products have become the focal themes in the leather sector. At present the indstry has reached a take-off stage in the export of value added products. During the 7th plan period the exports of leather and leather products registered a phenomenal growth over the years particularly leather goods and the footwear.

Despite impressive rate of growth of leather and leather products exports in eighties, the share of these items in the global imports was not so encouraging. Global imports of leather and leather products and India's share in 1987 is presented in Table III.

It can seen from the table that except in the case of leather (9.3%) and footwear components (22%) India's share in the global imports was very much limited. In the overall global imports of leather and leather products, India's share was only

Table - I

AVAILABILITY OF HIDES AND SKINS DURING 1990-91 TO 2000 AD

Species	Population in 1986 (M. heads)	Growth rate during 1972-82	Population as projected on above growth rate (in million heads)			Off-take rates	Availability of hides & skins (in million pieces)		
			1990-91	1994-95	2000		1990-91	1994-95	2000
Cattle hides	201.4	0.88	208.5	215.8	227.2	11.6	24.19	25.03	26.35
Buffalo hides	75.7	2.06	81.9	88.6	99.6	23.3	19.08	20.64	23.21
Goat skins	111.0	4.04	128.9	149.7	186.0	67.3	87.40	101.50	126.10
Sheep skins	52.1	2.03	56.3	60.9	68.3	62.0	34.90	37.76	42.35

Table - II

TOTAL INSTALLED CAPACITY AND ACTUAL UTILISATION IN INDIAN TANNERIES

(in Million Sq.ft.)*

Sl. No.	Items	Installed capacity			Actual processing			%		
		SSI	Organised sector	Total	SSI	Organised sector	Total	SSI	Organised sector	Total
1.	Hides	1176	252	1428	712	164	876	61	65	61
2.	Skins	641	166	807	412	120	532	64	72	66
	Total	1817	418	2235	1124	284	1408	62	68	63

* One hide is = 23 sq. ft. (including sole and split leather and one skin = 5 sq. ft.

Table - III

ESTIMATED GLOBAL IMPORT & INDIA'S EXPORT (1987)

(Rs. in crores)

Products	World	%	India	%	India's share (%)
1. Leather	6,000	12.91	558	44.81	9.30
2. Footwear	23,625	50.81	129	10.36	0.54
3. Footwear components	1,875	4.03	323	25.95	17.22
4. Leather garments	6,000	12.90	105	8.44	1.75
5. Other leathergoods	9,000	19.35	130	10.44	1.44
	46,500	100.00	1,245	100.00	2.67

Table - IV

INDIA'S EXPORTS OF LEATHER AND LEATHER PRODUCTS DURING 1980-81 TO 1990-91

(Rs. Millions)

Description	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
Hides & skins	6.9	4.4	2.2	1.9	0.4	0.3	0.1	Nil	Nil	Nil	Nil
E.I. tanned hides	304.5	335.4	295.4	378.0	457.9	461.9	425.3	258.0	83.8		
Wet blue (chrome tanned hides & skins)	198.8	197.7	157.5	139.0	196.1	215.6	152.6	295.6	208.1	210.6	39.7
Tanned reptile skins	0.3	0.8	Nil	0.2	1.1	0.9	2.0	Neg.	Nil		
Tanned/Dressed fur skins	8.4	1.3	4.3	3.8	0.3	Nil	4.7	1.4	11.5		
Total	512.0	535.2	457.2	521.0	655.4	678.4	584.6	555.0	303.4	210.6	39.7
Finished leathers	2267.9	2264.0	2098.9	2352.8	3609.6	3339.4	4084.2	5382.5	6497.1	6935.3	7656.2
Leather footwear	337.5	300.5	286.2	309.7	446.8	413.3	689.3	1227.8	1403.2	1714.3	2104.4
Footwear components	450.7	772.2	876.2	1214.7	1749.2	2235.6	2293.2	2947.9	3808.3	5182.5	5860.0
Leather goods	300.5	360.2	361.4	435.9	710.5	864.8	1399.3	2285.1	3123.2	6030.7	9878.2*
Leather manufactures	137.6	119.7	164.6	194.7	244.1	203.1	333.7	435.4	623.4	226.9	
Leather sportsgoods	102.5	86.8	96.4	74.9	66.1	50.9	49.5	52.5	42.6	N.A.	N.A.
Total IV	1328.8	1639.4	1784.8	2229.9	3216.7	3767.7	4765.0	6948.7	9000.7	13154.4	17842.6
Grand Total	4115.6	4443.0	4343.1	5105.6	7482.1	7785.8	9433.9	12886.2	15801.2	20300.3	25538.5

2.67% in 1987. India's exports of leather and leather products from 1980-81 to 1990-91 are presented in Table IV.

It can be seen from the Table that India's leather exports which were in the order of Rs. 4116 million in 1981 reached to a level of Rs. 25,539 million by 1991, thus registering more than six-fold increase. The most important and encouraging development is the basic changes in the composition of exports in favour of value added products. The share of value added products which was of the order of Rs. 1328.8 million in the total exports in 1980-81 had reached to a level of Rs. 17,842.6 million in 1990-91, registering more than thirteen fold increase over the years. Aware of the potentiality of value added products, the Government has initiated number of incentives to encourage the exports of products. It is expected that sooner rather than later the Government is likely to restrict the exports of finished leathers in favour of products. The export performance of different products over the years is discussed below.

During 1980-81 to 1990-91, the export of finished leathers increased from Rs. 2267.9 million to Rs. 7656.2 million registering an increase of 337.6%; during the same period the exports of leather goods multiplied from Rs. 328.8 million to Rs. 17,842.6 million, registering an increase of more than thirteen-fold. The organised sector of leather products industry witnessed a boom in the Seventh Plan period both in investment and creation of additional capacities. The total licensed capacity upto the beginning of the 7th plan period was only 34 million pairs of leather footwear, 20 million pairs for shoes and negligible capacity in leather goods and garments. During 7th plan period alone, Letters of Intent have been granted for 29 million pairs of leather footwear, 33 million pairs for shoe uppers, 0.8 million pieces for leather garments and 1.8 million pieces for leather goods. Aware of the export potentialities of leather products, the 8th Plan targets have been substantially raised over 7th plan targets. Value-wise and quantitative targets for export of leather goods during 8th plan period are presented in Table V and IV.

Productwise analysis

As stated earlier, that despite substantial export growth of leather and leather products, the overall share in the world market is only 2.67%. However, it is expected that during 8th plan period, India's share in the global imports are likely to improve its position. To have an itemwise performance of leather products, productwise analysis is presented below.

Footwear

The total production of leather footwear in the country which was of the order of 300 million pairs in the beginning of the first year of the 7th plan was expected to reach a level of 380 million pairs in 1990-91 and to 456 million pairs by

Table - V

PROPOSED TARGETS FOR EXPORT FOR EIGHTH FIVE YEAR PLAN

(Rs. in million)

Items	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
1. Semi-finished leather	400.00					
2. Finished leather	6000.00	6300.00	6620.00	6950.00	7200.00	7500.00
3. Foodwear (20% p.a. rate of growth)	2500.00	3000.00	3600.00	4320.00	5184.00	6220.00
4. Shoe uppers/Footwear components (15% p.a. rate of growth)	5100.00	5865.00	6745.00	7756.00	8920.00	10258.00
5. Leather garments (15% p.a. rate of growth)	1600.00	1840.00	2116.00	2433.00	2798.00	3218.00
6. Leather goods	2400.00	3000.00	3750.00	4690.00	5860.00	7320.00
	1800.00	20005.00	22831.00	26149.00	29962.00	34516.00

Table - VI

QUANTITATIVE TARGETS FOR EXPORT OF LEATHER AND LEATHER GOODS IN 8TH FIVE YEAR PLAN

(In million pairs/@ Rs. per pair)

Items	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
Fashion shoes (closed)	6.95 prs @ Rs.180/pr	8.33 prs @ Rs.180/pr	9.47 prs @ Rs.190/pr	11.5 prs @ Rs.200/pr	13.3 prs @ Rs.210/pr	15.0 prs @ Rs.220/pr
Ladies shoes (Prsrachis, Ballerinas etc.)	12.95 prs @ Rs.85/pr	15.30 prs @ Rs.85/pr	17.65 prs @ Rs.85/pr	18.9 prs @ Rs.90/pr	22.0 prs @ Rs.95/pr	25.0 prs @ Rs.100/pr
Others	2.35 prs @ Rs.85/pr	2.35 prs @ Rs.85/pr	3.50 prs @ Rs.85/pr	3.5 prs @ Rs.90/pr	4.0 prs @ Rs.95/pr	5.0 prs @ Rs.100/pr
Shoe uppers	12.75 prs @ Rs.50/pr	18.92 prs @ Rs.155/pr	21.00 prs @ Rs.160/pr	23.5 prs @ Rs.165/pr	25.5 prs @ Rs.175/pr	27.8 prs @ Rs.185/pr
	18.00 prs @ Rs.120/pr	18.77 prs @ Rs.125/pr	21.00 prs @ Rs.130/pr	22.2 prs @ Rs.140/pr	24.0 prs @ Rs.150/pr	25.6 prs @ Rs.160/pr
	10.00 prs @ Rs.100/pr	5.86 prs @ Rs.100/pr	6.50 prs @ Rs.105/pr	7.4 prs @ Rs.105/pr	8.5 prs @ Rs.105/pr	9.3 prs @ Rs.110/pr
Garments (per piece)	1.75 pcs @ Rs.910	1.98 pcs @ Rs.930	2.23 pcs @ Rs.950	2.51 pcs @ Rs.970	2.8 pcs @ Rs.1000	3.06 pcs @ Rs.1050
Leather goods assorted/piece	24.00 pcs @ Rs.100	27.27 pcs @ Rs.110	28.85 pcs @ Rs.130	31.27 pcs @ Rs.150	36.62 pcs @ Rs.160	40.66 pcs @ Rs.180

1994-95, the final year of the 8th five year plan. Although footwear accounts for 51% of global imports of leather and leather products, India's share is only 0.54%. India's share in the major importing countries during 1987 is presented in Table III.

In the changing international scenario, the opportunities for the exports of footwear from the country are quite encouraging. The leading footwear exporting countries like South Korea, Taiwan are facing similar problems of developed countries such as ever increasing wages.

Footwear Components

Export of footwear components from India is one of the major items which is making a dent in the international market. In 1987, India's share of footwear components in the global imports was 17.22% and expected to improve its share during the 8th plan period. Shoe uppers and footwear components are expected to reach a level of Rs. 8920 milllion in 1994-95 from Rs. 5,100 million in 1990-91.

Leather Garments

Exports of leather garments is the another item which has maintaing an upward trend. The garment exports from India which was in the order of Rs. 4.17 million in 1972-73, reached to Rs. 51.70 million in 1980-81 and Rs. 1057.21 million in 1987-88. The proposed export for leather garment by the end of 8th plan is Rs. 2,798 million (1994-95).

Leather Goods

India's exports of leather goods are quite phenomenal from 1986-87 onwards. The exports which were in the order of Rs. 864.8 million in 1985-87 increased to Rs. 1399.3 million in 1986-87, and to Rs. 9878.2 million in 1990-91. Inspite of a faster rate of growth of exports, India's share in global market is only around 1.5/%. India faces stiff competition from countries like South Korea, Hong Kong, Singapore, etc. During the 8th Plan period, India's exports of leather goods are expected to reach a level of Rs. 5,860 million in 1994-95.

8th Five Year Plan and the Leather Industry

It is expected that India's total value of output of leather industry is expected to reach a level of Rs. 7838 million by 1994-95, providing necessary allowance for inflation and the pace of growth in the export sector is estimated to be 18.4% per annum for the 8th plan period. To reach the targets fixed for the first and final year of 8th plan period, requirement of leather would be 1445 million sq.ft. and 1804 million sq.ft. respectively. As against the total requirement of leathers, the total availability of finished leather in the country will be 1375 and 1593 million sq.ft. in 1990-91 and 1994-95 respectively. It clearly indicates that there will be a shortage of 70 million sq.ft. in 1990-91 and 210 million sq.ft. in 1994-95. The Table-7 presented below clearly indicates the total demand and supply of finished leathers from indigeneous sources.

It can be seen from the above table that throughout the 8th five year plan period there will be a shortage of basic raw material and more so in the case of hide based leathers from indigenous sources.

Technology Base

India has emerged as a major exporter of leather, but is yet to emerge as a leader in the global trade on leather products. If India wants to emerge as a major power in the global leather sector, it is necessary to re-examine our current approaches and make wherever necessary changes to bring a quantum jump in the share of world market for leather product.

India is strongly dependent upon the west for design and fabrication methodologies. The indigenous design capability needs to be developed. Technology sources for leather product manufacture need to be strengthened. Imported technologies, if any, for the leather product sector needs to be totally absorbed and elaborated in the Indian context. Quality assurance in the leather product sector has to be necessarily established. Unless adequate measures are taken to network the design and fabrication capability with a sustained market intelligence, quantum jumps in the exports of leather products sector may be difficult to achieve. The role of a jobber in the global leather product market cannot help India emerge as a major power in the international leather trade.

Marketing Strategies

On global markets, marketing of intermediary products is totally different than that of marketing of consumer products, more particularly for late entrants. At present countries like South Korea, Taiwan, Hong Kong and Singapore have a strong footing in international market for medium and low priced leather goods while developed countries like France, Spain etc. have major share for high priced items. India has made inroads in the global market inspite of the disadvantage of entering the market late. However, it is necessary not only to consolidate the gains but also to improve upon its overall share for leather products in the international markets. As country's thrust is on exports of consumer products there is every need to have better market strategies, keeping in view of the strengths and weaknesses of India and its competitors in the global markets and few of them are highlighted below.

Brand Promotion

During the Seventh Plan period India has moved away from the status of honourable tailor or cobbler to one of a supplier of products. A few of the units have made a dent in the inter-

Table - VII

REQUIREMENT AND AVAILABILITY OF FINISHED LEATHERS DURING 8TH FIVE PLAN PERIOD

(Million sq. ft)

	Requirement		Availability		Deficit	
	1990-91	1994-95	1990-91	1994-95	1990-91	1994-95
Hides	781	989	763	896	18	93
Goat skins	461	563	437	508	24	55
Sheep skins	203	251	175	189	28	62
Total	1445	1803	1375	1593	70	210

national market by their own brand name, but such of those firms are very limited. Now the time has come for India to create a brand name of its own and also establish itself as a fashion setter at least in some of the traditional designs in which the country is strong enough.

Diversification of Markets

One of the weaklinks in the Indian exports of leather products is confining to a limited number of countries/regions. Of the total exports, Europe alone accounts for about 70%. Countries like Japan, Austria and the countries in the gulf region offer good market potentialities for leather and leather products. It will be better that concerted attempts are made at least in selected targeted markets to get a strong foothold in new markets and which could gradually be improved upon within a reasonable time.

Market Intelligence

Industry should have up-to-date market intelligence on continuous basis which could be possible by market surveys in the importing countries. To meet this, the Indian Embassies can strengthen the economic intelligence cell in respective countries. There is also a need for fuller activisation of promotion agencies. Participation of Indian exporters in the international fairs/exhibitions should be encouraged. Deputation of trade delegations to potential importing countries should be considered on a priority basis.

Training Institutes

In order to cater to the needs of global markets, India has to upgrade her available skills. There is an acute shortage of personnel like designers, skilled workers etc. To meet this demand, a training institute with the services of internationally reputed designers may be considered. Design studies need to be developed. Freelance designers from the west may be invited to train personnel in India. Fashion awareness has to be imparted. Stress on quality compliance and better productivity has to be made in training institutes.

Modernisation of Production

The production activity of leather products is mainly concentrated in cottage and small scale sector with minimum machinery. In the absence of machinery, the productivity as well uniform quality is much affected. Tools and techniques utilised in cottage and small scale sector are in general obsolete and need improvements. Of course, there are visible signs that the industry is tending to go in for modernisation, but it is rather moving in a slow pace. However, the organised sector is equipping itself with modern machinery, but even in this sector it has to speed up the pace of modernisation.

Professional Management

As the Indian leather exports are moving towards consumer products, it has to have a professional management to achieve quick results. Marketing of intermediary items like leathers is totally different from finished products particularly in fashion oriented items like leather products.

New Ventures

As it has been stated earlier, India is yet to develop its marketing skills in global markets and as a new entrant, it is being confronted with many problems. By starting joint ventures some of the problems like marketing, raw materials etc. could be overcome. India can think of having joint ventures in the processing of leathers with developing countries and in production and marketing of leather products with developed countries.

Conclusion

Inspite of her animal wealth and large raw hides and skins resources, India has a relatively low share in the global market for leather products. Many other countries with significantly lesser raw hides and skins resources, have achieved greater share of the global trade on leather products than India. Therefore, strategies for quantum jump in Indian exports of leather products need to involve possible import of raw hides/skins and wet blue, increased utilisation of tanning capacities and skill, increased conversion of finished leathers into products, planned phasing out of export of finished leathers, diversification into non-traditional areas such as export of sports footwear and other products with higher proportions of non-leather fabrics and more aggressive marketing methods including brand and design promotion.

If India were to emerge as a leader in the global leather trade, restriction on the exports of finished leather would become necessary. Even if all the finished leather in India is converted into products, the targets for 2000 AD are difficult to achieve unless unit value realisation from Indian leather products is achieved and a certain proportion of imported raw hides/skins or wet blue is processed in India and converted into products. Development of consumer markets for Indian leather products is essential. This would call for change in the approaches of Indian leather industry with respect to the design and development of innovative designs for leather products, better quality assurance and adherence to delivery schedules and more rational price policies. Research and training institutions would need to expand and increase their role in design and development of leather products on the one hand and train adequate quality and quantity of manpower to ensure quality standards in the leather products sector. Rational Government policies are essential for achieving quantum jump in the export of leather products.

News from Abroad

GLAXO WINS TECHNICAL AWARD AGAIN

Glaxo, the pharmaceuticals group and the UK's biggest company by market capitalisation, has won its fifth award for technology with its antibiotic, **Zinnat.**

Zinnat was developed because other drugs in its class needed to be injected and were therefore of little use outside the hospital environment. In addition, bacteria were building up resistance to existing antibiotics, such as penicillin, which were proving increasingly less effective.

The challenge for Glaxo was to develop a drug that was:

* Pleasant to swallow. The active ingredient within Zinnat, Cefuroxime Axetil, had an extremely unpleasant taste.
* Stable in water so that it retained its potency within the stomach and gut.
* Resistant to the enzymes in the gut but which could be ingested effectively into the body.
* Quick acting once it had been taken into the blood-stream.
* Without any toxic by-products and therefore without serious side-effects.
* Able to resist Beta-lactamase, a substance excreted by bacteria which prevents some antibiotics working effectively. Glaxo believes it tested as many as 10,000 different formulations at its Greenford research centre in north-west London over a period of about six years before it discovered the right drug. Its pharmacists also invented a new process to manufacture a wax coating around the drug. The coating was not unpleasant to taste but dissolved when required in the gut to release the active ingredients.

OPEC AGREES TO KEEP OIL OUTPUT STEADY

OPEC Oil ministers agreed to keep their output ceiling unchanged for now, declining to meddle with a formula that has helped boost oil prices by around $1.50 a barrel since February. "The ceiling remains unchanged," Indonesia oil minister **Ginanjar Kartasasmita** said after a ministerial meeting to review market conditions.

The decision leaves OPEC a formal production cap at just under 23 million barrels per day (bpd), though independent estimates put the group's output nearer 23.5 million bpd in March. Ginanjar said OPEC was currently pumping around 23.1 million bpd. Although some members, led by Iran, called for cutting production to boost prices, most ministers had played down the need to alter output policy, noting changes could wait until they hold their semi-annual meeting in Vienna on May 20.

That will give them time to judge the status of international economic sanctions that have blocked Iraq's oil exports since its invasion of Kuwait in August 1990. Although oil prices have firmed over the past 10 weeks, the average price for OPEC's basket of seven crudes has been stuck more than $3 below the group's target of $21 a barrel.

Saudi Arabia indicated that its current oil output, included the neutral zone it shares with Kuwait, is 8.07 million barrels per day (bpd), OPEC secretary General Subroto told reporters. He said Kuwait production for March was 780,000 bpd, including the Neutral Zone share, and that Iran said it was producing 3.182 million bpd.

OPEC's secretariat has predicted that demand for OPEC oil will average 22.7 million barrels per day in the second quarter of 1992, a delegate said. The secretariat report predicted third-quarter required production from OPEC, or drawdown from its stocks, would be 23.8 million barrels per day. For the fourth quarter, the figure was 24.1 million bpd, the delegate said, rounding the figures in the report to the nearest 100,000 barrels.

The delegate said a tentative estimate of the demand for OPEC oil in 1993 had been made by the Secretariat, but the figures were not included in the report. He said demand in the second half of 1993 would average "slightly over 26.0 million" bpd.

EC FACES PROBLEMS IN CURBING GREENHOUSE GASES

The European Community's plans to curb 'greenhouse gases' have run into difficulties, undermining the anti-global warming strategy which Brussels will take to the United Nations Earth Summit in Rio de Janeiro in June.

Two draft directives to monitor energy-use in buildings—which account for an estimated 47 per cent of EC energy consumption — were blocked at a meeting of senior European Commission officials recently.

The cause of the hold-up, according to one official, was a newfound reluctance by Brussels to interfere in matters which should properly be handled by member states. The directives are a critical part of the Commission's commitment to stabilise carbon dioxide emissions at 1990 levels by the end of the century. Part of the strategy which has drawn the most attention, and criticism, is the carbon and energy tax Brussels is poised to put forward next month.

But while industry is angered by the implications of the tax for competition, it is the conventional part of the strategy that is starting to unravel fastest of all. By the end of last month, for instance, only four of the 12 member states had submitted promised "complementary programmes" to cut CO emissions. Nor are the EC's own energy conservation and renewable energy programmes yet on stream.

Mr. Andrew Warren of the European Association for the Conservation of Energy, told a Forum Europe global warming seminar for industrialists recently that "there is no urgency behind these programmes from the Commission. Nor is there sufficient urgency from most member states for their programmes. In their absence, the (energy) tax becomes omnipresent."

The two directives causing problems will come up again for discussion by the full Commission within two or three weeks. The Commission itself is now unlikely to make up its mind until May 6 or May 13. This would leave the environment ministers' meeting due on May 26 as the last chance to formulate a greenhouse gas strategy to take to Rio.

EMINENTS CALL FOR GREENER ETHICS

A gathering of former Prime Ministers, Presidents and other eminent persons on April 17, have released the Tokyo Declaration calling for a "re-evaluation of the thinking which underlines our present society" and the adoption of "new environmental ethics." The meeting, a precursor to the UN's Earth summit in June, also asked governments to consider new taxes to protect the environment, to increase financial assistance to developing countries, and to settle quickly the Uruguay Round of multilateral trade negotiations.

The meeting, sponsored by the UN Conference on Environment and Development, urged Japan to take a political lead in the coming months to ensure the success of the summit in Rio de Janeiro and to broaden the debate on environmental ethics. **Mr. Noboru Takeshita,** Japan's former Prime Minister and official host of the three-day meeting, promised that Japan would build "a society oriented to preserving the environment", though he gave few specific examples of how this would be achieved. The declaration's reference to environment-related taxes was a sensitive point, as Japanese government officials had requested that the text not call directly for the introduction of taxes. Tokyo is now "informally" discussing a tax on carbon di-oxide emissions, similar to that introduced in Nordic countries.

In the final draft, the declaration's reference to taxes read: "Countries may also wish to consider special taxes and charges in the context of the global partnership being forged at Rio de Janerio, keeping in mind the impact on international competitiveness."

"We appeal to the leaders of all governments to come to the Earth Summit at Rio, prepared to commit themselves to the measures required to give effect to a new global partnership for sustainable development," the Tokyo Declaration added.

News From Japan

DUMPING OF JAPANESE ETHYLENE IN ROK SUSPECTED

The Ministry of International Trade and Industry (MITI) of South Korea appears to be taking steps, including proving and filing a suit in a court, against the alleged dumping of Japanese ethylene imported to S. Korea. It is very unusual for the S. Korean government to begin probing imports from Japan, particularly petrochemicals, in suspicion of dumping. In S. Korea, big business concerns such as Lucky, Samsung, Korea Petrochemical and Hyundai have successively put into operation 350,000-t/y capacity ethylene plants since last summer, bringing the nation's combined ethylene capacity to 2.6 million t/y. In addition, another two firms are likely to start operating similar capacity plants within the year, further flooding oversupplied ROK ethylene pool. This apparently made the Koreans sensitive to Japanese ethylene.

On the other hand, Japanese ethylene exports in 1990 totaled 109,000 tons, of which 107,000 tons went to S. Korea, and 162,000 tons out of 176,000 tons of exports supplied there in 1991, with most destined for the peninsula. The S. Korean government is said to have nearly finished the gathering of evidence for the alleged dumping of ethylene by two Japanese makers and polypropylene, also by a Japanese maker. Japan's MITI has made no comment on this, suggesting that it is not concerned. Japanese ethylene exports to S. Korea still remains high and it is believed that this is blamed on the Japan/S.Korea ethylene-supply agreements now in force and the falling yen exchange rate.

JAPANESE POLYOLEFIN SUPPLIERS PUSHING EXPORT DRIVES IN ASIA

Japanese polyolefin suppliers have been pushing export drives aiming at the Chinese and Southeast Asian markets where polyolefin demand has been on the rise. The export offensive is being taken to cope with a decline in domestic demand which began surfacing late last year.

Exports of low-density polyethylene (LDPE) have remained at a high level after surpassing 20,000 tons last October and those of polypropylene (PP) in February topped 20,000 tons. February exports of three major resins — LDPE, HDPE and PP — all scored gains of around 60% over the same month of the preceding year.

Japanese suppliers are increasingly dependent on exports in view of the prolonged dullness anticipated for the domestic market. Observers see growing competition with South Korean counterparts lying ahead of them and the problem of how to meet price competition being crucial to the Japanese.

Exports of LDPE last year stood at 230,000 tons; HDPE, 140,000 tons; and PP, 180,000 tons: developments since late last year indicate far larger exports in 1992. Taking into consideration the situation concerned, Japanese export offensives are unlikely to weaken but rather to intensify further, observers believe. Despite the reported slackening of the domestic market for commodity polymers, the nation's ethylene output in February reached 520,000 tons — a level requiring nearly full-capacity operation of all plants.

TEIJIN, AMOCO TO FORM SUPERENGINEERING-PLASTICS JOINT VENTURE IN JAPAN

Teijin Ltd., a maker of resins and pharmaceutical products, will set up a joint venture in Japan this year, in October at the earliest, with Amoco Performance Products Inc. of the United States to commercialize super-engineering plastics. The targeted products are polysulfone, polysulfone alloys, polyarylsulfone (PAS) and polyphenylsulfone, etc. They have to date been marketed in Japan by Amoco Japan Ltd. The new company will focus on the special plastics which can withstand temperatures over 160°C, and be used in a wide range of products, including automobiles and electric machinery.

Teijin hopes to work out the details and conclude a final agreement with Amoco Performance Products, headquartered in Atlanta, Georgia, near the end of the year. Amoco Performance Products is a subsidiary of Amoco Corp., a major U.S. holding company headquartered in Chicago. The new company, yet to be named, will initially import Amoco products (compounds) for sale in Japan, but will later switch to manufacturing its own products once a plant is built.

The two companies aim at the joint venture achieving annual sales of ¥10 billion ($74 million) after five years. They consider that now is the best chance for expanding PAS applications since ICI (U.K.) has decided to withdraw from polyether sulfone business the two products that are used for the same purpose. Teijin has plans to set up a research center in Chiba next year to advance work on super-engineering plastics.

SUMITOMO CHEMICAL STEPS UP ASIAN OPERATIONS

Sumitomo Chemical Co. has set up Sumitomo Chemical Asia in Singapore by reorganising a wholly-owned subsidiary — Lifetec Asia. This company is scheduled to commence dyestuff marketing this July in an effort to step up Asian operations, particularly in ASEAN countries. Lifetec Asia was established in July, 1990 to supply household-use insecticides and related products.

The leading Japanese chemical firm has embarked on a Singapore petrochemical venture in partnership with the Singapore government and the Shell

group of the United States. The Singapore subsidiary will deal with petrochemical products stemming from the joint venture and moreover, acrylic products and synthetic rubber, both already commercialised by Sumitomo Chemical itself.

TOMEN PURCHASES AUSTRALIAN DYE DISTRIBUTOR

Tomen Corp. has acquired Dyechem Industries — a Melbourne-based distributor of dyes, auxiliaries and other fine chemicals — in an attempt to promote dyestuff exports to Australia. The Australian firm imports Sumitomo Chemical dyes as a staple import item. It is expanding a market share on the strength of its own laboratory and elaborate technical service.

Tomen is endeavoring to aggressively invest in manufacturing/marketing companies overseas, shoring up allround capabilities covering production marketing and technical service. The leading Japanese trading house aims to have the new subsidiary attains annual sales of 10 million Australian dollars after three years. Japan's dye exports to Australia are steadily growing with the 1992 results expected to reach 27,000 tons, up 7.9% over the 1988 level.

AMINO ACID MAKER LICENSED AMERICAN FOOD-WASTE-INTO-LACTIC-ACID PROCESS

Kyowa Hakko Kogyo's American subsidiary and the U.S.'s Argonne National Laboratory (ANL) have reached an agreement to the effect that the Japanese firm will license the latter's technology for a basic process for producing lactic acid and polylactic acid from processed food waste as starting material.

The Japanese firm intends to develop application technology for the process so that it can be commercialised in Japan and the U.S. in two years time. Kyowa Hakko is one of the world's top amino-acid makers. ANL's process dubbed "Bio-Lac Process" is for production of lactic acid and polylactic acid via emulsification and fermentation, in the presence of catalysts, of the saccharide of the processed food waste produced in huge amounts in the manufacture of fried potatoes and cheese. This method may make it possible to produce biodegradable polymers at a price comparable with that of polyethylene- and polypropylene-based ones, a Kyowa Hakko official says.

The U.S. is reported to be producing 5 million tons of processed food waste a year in the manufacture of fried potatoes and 1-2 million tons of such waste in cheese production. The problem of how to dispose it of has thus been a social concern in the States. Kyowa Hakko U.S.A. Inc. and other Kyowa Hakko subsidiaries in the U.S. as well as the Japanese parent firm are considering producing lactic acid in the States from such waste utilising the new process and polylactic acid in the U.S. and Japan.

CAPACITY BUILD-UP PLANNED FOR 2,6-NDCA

Mitsubishi Gas Chemical Co. is considering building a 10,000-t/y plant for 2,6-naphthalenedicarboxylic acid (2,6-NDCA) in answer to growing demand for use in the production of polyethylene-naphthalate (PEN) resin and liquid-crystal polymer. With a subsidy granted by MITI, the company pioneered a new process to manufacture 2,6-NDCA from methyl-terephthalene at low cost and constructed in 1990 a 1,000-t/y plant based on the new technology.

It built after that a multipurpose plant capable of producing related derivatives including trimellitic chloride (modifier for aramid fiber) and aromatic carboxylic ester (special plasticizer). The 1,000-t/y plant is being operated at full capacity with the shortage of the product in the background. The company previously believed that it would be four to five years before construction of a large-scale plant was required but demand for 2,6-NDCA has grown more rapidly than anticipated earlier. The product is expected to form an important part of the company's specialty business.

MITSUBISHI AFFILIATE TO RAISE NONPOLLUTING SOLVENT CAPACITY

Yokkaichi Chemical Co. — in which Mitsubishi Petrochemical Co. has a 45% stake — is expected to complete an additional 10,000-t/y plant for butylglycol ether, a safe and nonpolluting solvent, by the end of the summer. The chemical has been in growing demand in Japan as an alternative to ethylglycol ether solvents causing environmental problems.

Plant construction will cost about ¥1,500 million ($11.2 million) and the completion of the additional plant will bring the firm's combined capacity for the chemical to 24,000 t/y. Butylglycol ether has been increasingly used as a solvent for paints and cleaners because it is very safe and produces no pollutant.

The chemical is one of the alternatives to ethylglycol ether-based solvents over which controls are likely to be tightened in the West, particularly in the U.S., because of its possibly harmful effects on the working environment.

Environmental Protection Agency and Occupational Safety and Health Administration of the U.S. are moving toward control of the chemicals, and before the likely enforcement of this control such chemicals are being replaced by alternatives including butylglycol ether. Mitsubishi Petrochemical forecasts that ethylbutyl-ether alternatives will continue to spread in Japan, too.

New Developments from Japan

JAPANESE FIBER-USE SURFACTANT KNOW-HOW LICENSED TO PAKISTAN

Nikka Chemical Co. has concluded an agreement with Pakistan's Beta Chemicals Ltd. to license Nikka's fiber-use surfactant-production know-how to the latter. The Japanese firm says that the two firms have also agreed to launch surfactant production in Pakistan by establishing a joint venture. The value of the contract concerned has not been revealed.

Nikka has been exporting its surfactants to the Pakistani firm since 1988 through Toyota Tsusho Corp. Before that Beta Chemical had been a sales agent for such surfactants of Hoechst's for the Lahore market but switched to being an importer of the Japanese chemicals to avert keen competition with other Hoechst agents in Pakistan.

It is said that industrial activities in Pakistan have gradually been shifting to Lahore or the Punjab from Karachi which is confronting political unstability and delayed building-up of infrastructure.

The Pakistani fiber industry has been oriented toward exports with about one-third of all workers in the nation engaged in the fiber industry and over 60% of her exports accounted for by fiber and textile products mostly comprising cotton and cotton cloth. Her products, however, have an added value of only 30% and the industry is heading for higher value-added products by means of secondary and tertiary processing applied to them. Nikka sees Pakistani demand for fiber-use surfactants growing for certain.

DIC TO BOOST ANTIGERM MASTER BATCH OPERATIONS

Dainippon Ink and Chemicals Inc. (DIC) will push opertions for its compound master batch giving the resin concerned antibacterial, antimold, or deodoring properties, etc. There has been growing demand for such resin for use in various consumer goods.

The firm is striving to expand its lineup of such master batch to meet growing consumer requirements for healthier and more comfortable products. The series of DIC master batch products are used by mixing with polyethylene, polypropylene, polystyrene, ABS or PVC to give them such properties as antibacterial, antimold, seaweed insectmite-inhibition and deodoring ones.

The master batch contains no heavy metal and clears all the requirements set by the relevant laws such as the Food Sanitation Law. The firm now offers 10-odd such items as master batch. The products are used for resin for kitchen and batch-use goods and have recently been increasingly used for plastic parts of refrigerators, air-conditioners and washing machines to prevent growth of bacteria and mold on them and also prevent them from having bad odors. The firm says achieving the desired quality of such master batch is dependent upon the selection of materials suitable for granulation and having proper heat resistance in addition to resin technology.

KURARAY'S SOLVENT OUSTING CONVENTIONAL PRODUCT

3-Methyl-3-methoxybutanol (MMB) — a high boiling-point solvent — has been smoothly replacing ethylene glycol monobutyl ether (EGME) with MMB's annual demand exceeding 10,000 tons at the end of last yer. The product was commercialized by Kuraray Co., 15 years ago.

The product is being increasingly employed for household-use cleaning agents and solvents for a coating process for automobiles. It has low toxicity and high solubility and less smell compared with EGME. There is growing interest in the low-toxicity solvent in the United States and Europe and a total of about 1,000 tons of the product have been shipped to these regions. Demand for the product is expected to expand markedly there for use in cleaning agents and deodorants, reflecting mounting concern about solvent toxicity. The company is considering implementing full-fledged overseas operations including MMB production abroad. MMB has now come to be used in the form of agrochemicals and insecticides.

Far more stringent regulations have been imposed on ethylene-based glycol-ether solvents since April, 1990 in accordance with the Labor Safety and Sanitation Law. This move has encouraged the spread of use of MMB.

THRIVING POWDER PAINT BUSINESS MIRRORS ENVIRONMENTAL CONCERN

The Japanese market for powder paints has become active reflecting public concern over environment destruction caused by the manufacturing of goods. Paint and resin makers of Japan are thus hurrying to expand capacity.

Nippon Ester Co., an Osaka-based powder-paint-use polyester-resin maker, has started construction to double capacity for the resin to 6,000 t/y by 1993. Dai Nippon Toryo Co. has recently completed a 2,400 t/y plant for powder paint having high corrosion resistance at its Komaki factory (Aichi Prefecture). The paint maker says that there is growing demand in Japan for powder paint with high corrosion resistance as well as that for use on household electrical appliances. The latest capacity expansion has brought the firm's combined powder-paint capacity to 6,000 t/y. Kawakami Paint Manufacturing Co. has also decided to boost its powder-paint capacity by 20-30% to around 1,500 t/y.

Other paint makers are eager to strengthen their power-paint business by improving production systems or by other means.

This reflects a sweeping trend in Japan toward use of environmentally friendly products in many fields. Paint maker's shift to water-based paints and powder paints is in line with such a trend.

In Europe, powder paint demand is said to be rising at a pace of more than 10% a year, and this trend is expected to be seen in Japan. Even so, powder paints have a problem with regard to glassiness and other aspects of appearance compared with traditional paints using organic solvents.

It is forecast that the Japanese paint market will genrally shift to either water-based paints or powder paints depending on the places and types of products on which paint is applied.

FINE SILICON-DIOXIDE POWDER EMPLOYED FOR FOOD ADDITIVE

Nippon Silica Industrial Co. intends to start marketing silicon dioxide (fine particles) in earnest; the product can be used as a food additive. The company has conducted sample deliveries since last October and aims to expand annual sales of the product to 1,000 t/y by 1995.

The product was approved as a food additive in the United States some time ago but in Japan its application to this field was authorized only in Janaury of last year. The company had its Nanyo factory approved last September as one capable of producing the said food additive.

The product is based on high-purity sodium silicate; it is tasteless, colourless and stable against heat and acid. It prevents saalt, sugar and powdery foods including instant coffee from solidifying and improves their fluidity. In addition, it helps turn liquid/oily products into powdery ones. The company envisions exploiting new application fields for the product on the strength of its excellent properties of absorbing oil and retaining water, taking into account that trade competition is being intensified with regard to silicon dioxide for food-additive applications.

CHOLESTEROL-REDUCING AGENT WILL ENTER CLINICAL TESTS

Mitsubishi Kasei Corp. will soon kick off clinical trials on a new agent (MCI 121) aimed at lowering the lipid (cholesterol) level of the human body. The product is capable of inhibiting the biothesis of cholesterol and, what is more, triglyceride, which is thought to be involved in arteriosclerosis.

There is growing demand in Japan for cholesterol-reducing agents along with the graying of society and westernization of eating habits, both of which have resulted in an increase in the number of cases of arteriosclearosis and heart diseases. The company has already started phase-II clinical tests on another chlesterol-reducing agent (MCI 196), which is intended to remove cholesterol by having ions adsorb the substance. The related technology has been licensed to Bristol-Myers Squibb (U.S.) which is wrestling with clinical trials on the said agent.

In a related development, the Japanese company is conducting research on synthesis of an A-CAT (acyl- CoA/cholesterol acryltransferase) inhibitor, which — some researchers claim —outperforms HMG-CoA inhibitors (up-to-date cholesterol reducers) in lowering the cholesterol level and preventing the substance from sticking to the walls of blood vessels. Mitsubishi Kasei is confident that allthree items will become large-volume pharmaceuticals.

MARKET INFORMATION

Titanium dioxide firm, rest steady

Conditions remained easy in the Bombay Market. Transporters' agitations at various places have upset deliveries. Titanium dioxide (Anatase) firmed up by Rs. 5/- to Rs. 70/- following shortage of materials.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on April 28, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.00
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	4.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	102.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	5.00
Borax (Granular)	35.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	85.00
Butyl carbitol	110.00
Caustic soda (Flakes)	18.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	6,400.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	195.00

Hydro	58.00
Hyflosupercell	42.00
Hexamine (Resale)	34.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	60.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	210.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	42.00
Phthalic anhydride (Resale)	42.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	95.00
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	70.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	115+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	16.50
Acetic Anhydride (Resale)	34.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	65.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	115.00
Chloroform	65.00
Carbon Tetrachloride	27.00
Cellosolve	70.00
Cyclohexanone	80.00
Cyclohexanol	85+ST
Diacetone (Resale)	29.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG) (Resale)	48.00
Dioctyl Phthalate	69.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	24.00
Ethyl Acrylate	92.00
Ethylene Dichloride	21.00
Ethylene Glycol	32.00
Formic Acid (Imp.)	34.00
Formaldehyde (Resale)	7.75
Glycerine (CP)	70.00
Glycerine (IW)	65.00
Hydrogen Peroxide 50% (Resale)	45.00
Isopropyl Alcohol	42.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	115.00
Melamine	62.00
Methyl Ethyl Ketone	60.00
Methyl Isobutyl Ketone	60.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	30.00

Carbitol	115.00+ST
Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	66.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	17.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.50
Xylene (Ortho)	25.50

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	85.00
Alpha Naphthol (Imp.)	225.00
Aceto Acetic Ester (Methyl)	155.00
Acetanilide	62.00
Anthraquinone	135.00
Anthranilic Acid	115.00
2-Amino 4-Nitrophenol	160.00
Blue B. Base (Local)	330.00
Beta Naphthol	78.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid (IDI)	650.00
BON Acid	133.00
CPC (Crude)	115.00
Chicago Acid (Atul)	350.00
Coach Acid	68.00
Cyanuric Chloride (German)	255.00
DEMAP	275.00
2,4-DNCB	35.00
Dichlone (Imp.)	450.00
Dimethyl Aniline	85.00
Diethyl Aniline	145.00
Diethyl Sulphate (Japan)	93.00
Diethyl Sulphate (Local)	80.00
Diamino stilbene disulphonic acid	220.00
3,3-DCB	260.00
Diphenylamine (U.K.)	155.00
Gamma Acid (Atul)	225.00
Gamma Acid (Local)	190.00
H. Acid (Atul)	170.00
G. Salt	82.00
J. Acid	375.00
J. Acid Urea	450.0
K. Acid	125.0
MPDS (Local)	155.0
MNA	130.0
Meta Ureido Aniline	190.0
MPD (Local)	175.0
MPD (German)	210.00
N-Methyl J. Acid	515.00
N-Methyl Aniline	125.00
Naphthalene (Refined)	37.00
Ortho Anisidine (OA) (Imp.)	107.00
Ortho Dichloro Benzene (ODCB)	20.00
OT Base	170.00
OT Liquid	75.00
Para Dichloro Benzene (PDCB)	33.00
Para Anisidine (PA local)	160.00
PNA	95.00
Para Cresidine (Imp.)	330.00
Para Amino Azo Benzene (India)	135.00
PNCB (HOC)	58.00
Para Nitro Toluene	92.00
1-Phenyl 3-Methyl 5-Pyrazolone	175.00
Phenyl J. Acid	415.00
PT Base	165.00
Rhoduline Acid	600.00
Resist Salt 80%	26.00
Resorcinol	350.0
Sodium Naphthionate	85.0
5-Sulpho-Anthranilic Acid	115.0
Sulphanilic Acid	38.0
Sulpho Tobias Acid	155.0
Tobias Acid (Imp.)	115.0
Metanilic Acid	48.0
MTD (German)	185.0
Vinyl Sulphone	130.0

Bombay Drugs Market

(Prices as on April 28, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	540
Aluminium Hydroxide IP	43
Ampicillin Sodium	4300
Ampicillin Trihydrate	3250
Aminophylline	360
Amitryptylline HCl	5500
Amoxycilline Trihydrate	3400
Albendazole	2700
Analgin	360
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromine	120
Bromhexine HCl	2300
Butylated Hydroxy Anisole	1400
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	260
Calcium Lactate	30
Calcium D Pantothenate	1550
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2950
Chlorpropamide	230
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3300
Cimetidine	3350
Citric Acid IP	110
C.P. Maleate	1175
Cyproheptadine HCl	27000
D-Panthenol	2000
Diclofenac Sodium	2500
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	710
Diloxanide Furoate IP	500
Diphenhydramine HCl	375
Disodium Hydrogen Citrate	115
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	575
Ethyl Oleate	180
Fenbendazole	2800
Ferrous Fumarate	52
Ferrous Gluconate	135
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	800
Glyceryl Glycol Ether	675
Griseofulvin	2100
Guanidine Nitrate	51
Gallic Acid	475
Hydrazine Hydrate	120
Hydroxylamine HCl	600
Hydroxylamine Sulphate	115
Ibuprofen IP	500
Imipramine HCl	5000
Indomethazine	1125
I.N.H.	375
Inositol IP	1600

Product	Rs./kg.
Iodochloro Hydroxyquinoline	550
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	115
Lactic Acid (Japan)	165
Levamisole	2000
Lignocaine HCl	450
Lignocaine Base	450
Loperamide	3300
L. Lysine Feed Grade	180
L. Lysine Pharma Grade	280
Magnesium Hydroxide	35
Magnesium Trisilicate IP	15
Mannitol USP	325
Mebendazole IP	575
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	425
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	600
Metronidazole Benzoate	570
Morpholine	175
Neomycine Sulphate	4500
Niacin	300
Niacinamide	400
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4500
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	150
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1500
Pheniramine Maleate	1475
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1900
Phthalyi Sulphathiazole	450
Piperazine Citrate	380
Piperazine Hexahydrate	175
Prochlorperazine Maleate	8500
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2100
Pyroxicam	3200
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	250
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	[illegible]

Product	Rs./kg.
Sulphacetamide Sodium	380
Sulphadoxine	2800
Sulphamethoxazole	390
Sulphasomidine	475
Sulphaphenazole	325
Terbutaline Sulphate	30000
Tinidazole	480
Theophylline Anhydrous	415
Thiacetazone	300
Thoridazine HCl	18000
Thycol (Potassium Gluconate Sulphate)	500
Tolbutamide	225
Trifluopromazine HCl	11500
Trifluoperazine HCl	13000
Trimethoprim IP	1900
Tween 80	280
Vitamin B6 Hydrochloride	2600
Vitamin B2 5-Phosphate	5000

DRUGS INTERMEDIATES

Product	Rs./kg
1-Amino-4-Methyl Piperazine	1300
2-Aminopyridine	575
Beta Picoline	230
2-Chloro Propionic Acid	50
2-Chloro Propionic Chloride	80
3-Chloro 4-Fluoro Aniline	1500
2:4-Dichloro Benzoic Acid	550
2,6-Dichloro Aniline	850
3,4-Diamino Benzophenone	460
Diethyl Malonate	95
Diethyl Oxalate	45
Dimethyl Acetamide	175
Dimethyl Amino Ethyl Chloride HCl	220
Dimethyl Dichloro Silane	195
Dimethyl Sulphoxide	165
Furoic Acid	165
Isobutyl Benzene	175
Lasamide	875
2,6-Lutidine	1750
1-Methyl 1-Amino Methyl Thio 2-Nitro Ethane	1550
2-Methyl 5 Nitro Imidazole	205
Methyl Acetoacetic Ester	120
Methyl Chloro Formate	100
Methyl Isothiocyanate	400
Nitromethane	200
N-Butyl Diethyl Malonate	170
N-Methyl Piperazine	800
Ortho Nitro Benzaldehyde	1400
Para Chloro Benzoic Acid	190
Para Hydroxy Acetophenone	800
Para Hydroxy Phenyl Acetamide	1800
Pivaloyl Chloride	410
[illegible] Anhydride	[illegible]

Bombay Dyes Market

(Prices as on April 28, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Madras Market

After a long stretch of holidays markets have opened with a positive note. Caustic soda flakes prices were stable. Hydros received less support and inspite of lower availability prices remained same. Prices of nickel salts went up due to spurt in the prices of nickel metal. Similarly tin salts prices also went up substantially. Citric prices went up to Rs. 125/- on good demand due to summer. Availability of chloromethanes was better and the prices have shown a downward trend. Due to NOCIL's plant closure for annual maintenance there was scarcity for IPA, MIBK, octanol etc. and the prices were ruling high.

(MADRAS MARKET RATES AS ON APRIL 25, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.50
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	45.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per 50 kgs)	300.00
Borax (per 50 kgs)	1,700.00
Boric Acid (per 50 kgs)	3,200.00
Calcium Chloride Solid (per kg)	4.50
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	8.00
Calcium Carbonate (Precipitated) (per kg)	7.00
Caustic Soda Flakes (per kg)	19.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	38.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.00
Ferrous Sulphate Crystal (per kg)	11.00
Hydros (TCPL) (per kg)	57.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	43.00
Hyflosupercell (per kg)	48.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	30.00
Magnesium Chloride (per kg)	5.50
Magnesium Sulphate (per kg)	5.50
Mercury (per 34.5 kgs)	8,600.00
Nickel Chloride (per kg)	210.00
Nickel Sulphate (per kg)	210.00
Phosphoric Acid (per kg)	35.00
Potassium Carbonate (per kg)	35.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	35.00
Soda Ash (TAC) (per 75 kgs)	520.00
Soda Ash (TATA) (per 75 kgs)	520.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	95.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	12.00
Sodium Sulphite (per kg)	14.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	29.00
Sodium Tripolyphosphate (per kg)	29.00
Trisodium Phosphate (per kg)	16.00
Titanium Dioxide (Anatase) (per kg)	66.00
Titanium Dioxide (Rutile) (per kg)	98.00
Zinc Chloride (per kg)	22.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	14.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	38.00
Acetic Acid (per kg)	22.00
Acid Slurry (per kg)	38.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	125.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	67.00
Glue Flakes (per kg)	18.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	340.00
Oxalic Acid (per kg)	18.00
Pentaerythritol (per kg)	67.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	215.
Phthalic Anhydride (per kg)	46
Sodium Acetate (per kg)	14
Sodium Alginate (per kg)	280
Sorbitol (per kg)	27
Urea (Technical) (per kg)	4

SOLVENTS

Acetone -- HOCL (per kg)	32
Benzene (per litre)	22
Butanol (per kg)	60
Butyl Acetate (per kg)	60
Carbon Tetra Chloride (per kg)	35
Cellosolve (per kg)	80
Chloroform (per kg)	36
Diacetone Alcohol (per kg)	44
Diethylene Glycol (per kg)	50
Di-butyl Phthalate (per kg)	66
Di-octyl Phthalate (per kg)	66
Ethyl Acetate (per kg)	27
Isopropyl Alcohol (per kg)	39
Methanol (per kg)	14
Methylene Chloride (per kg)	26
Methyl Ethyl Ketone (per kg)	66.
Methyl Isobutyl Ketone (per kg)	60
Octanol (per kg)	75
PEG 400 (per kg)	60
Perchloroethylene (per kg)	40
Propylene Glycol (per kg)	66
Trichloroethylene (per kg)	32
Trichloroethane (per kg)	37
Toluene (per kg)	23
Xylene (per kg)	30

CALCUTTA MARKET
(Prices as on April 26, 1992)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	2,750.00
Camphor (per kg)	92-94.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	800.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	285.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

KARNATAKA ANTIBIOTICS & PHARMACEUTICALS LIMITED

(A Government of India Enterprise)
"Nirman Bhavan", 80 Ft Road, Ist Block, Rajajinagar, Bangalore - 560 010
Phone ; 322555, 323301-4 ,Grams, `SAVE LIFE' Telex : 845-8181 KAPL IN :FAX NO. (091) (812) 321 350

MATERIALS MANAGEMENT DEPARTMENT

SUB:Tender notice Number K/154-01-06 Dated 30th April, 1992.

SEALED TENDERS are invited in duplicate from Manufacturers or their Authorised Distributors or Indenting Agents for supply of the following Bulk Drugs and Packaging Materials, on phased delivery basis, for a period of one year.

Sl. No.	Material Description	Quantity	Tender Fee (Rs.)
	BULK DRUGS		
1.	Ampicillin Sodium Sterile IP.	2850 Kgs	250
2.	Ampicillin Trihydrate IP Plain/Compacted.	1700 Kgs	250
3.	Amoxycillin Trihydrate IP.	1600 Kgs	250
4.	Analgin IP Injectable Grade.	1750 Kgs	150
5.	Atenolol USP.	250 Kgs	150
6.	Cloxacillin Sodium Sterile IP.	200 Kgs	150
7.	Cloxacillin Sodium IP Compacted.	900 Kgs	250
8.	Diclofenac Sodium Tablet Grade JP.	750 Kgs	250
9.	Domperidone USP.	40 Kgs	200
10.	Erythromycin Esteolate IP	300 Kgs	200
11.	Gentamycin Sulphate IP/BP	280 Kgs	200
12.	Levamisole Hydrochloride IP/BP	500 Kgs	200
13.	Lactobacillus Sporogens Powder 6000 Million Spores per gram.	270 Kgs	150
14.	Mebendazole IP/USP.	1500 Kgs	200
15.	Rifampicin IP	200 Kgs	200
16.	Sulphamethoxazole IP.	1750 Kgs	150
17.	Sulphaguanidine IP.	8200 Kgs	200
18.	Tetracycline Hcl. IP.	1200 Kgs	200
19.	Trimethoprim IP.	400 Kgs	150

Sl. No.	Material Description	Quantity	Tender Fee (Rs.)
	BULK DRUGS (IMPORTS)		
20.	Ampicillin Sodium Sterile BP.	600 Kgs	200
21.	Penicillin G. Sodium Sterile BP.	2800 Bus	250
22.	Penicillin G. Procaine Sterile BP.	6600 Bus	250
23.	Chloramphenicol Sodium Succinate Sterile BP.	800 Kgs	250
	PACKAGING MATERIALS		
24.	Aluminium Seals Tear Off 20 MM.	280 Lacs	200
25.	Duplex White 300 GSM Board top opening cartons with 5 x 5 partitions	8 Lacs	150
26.	Glass Vials Type I Clear 3 ML.	19 Lacs	200
27.	Glass Vials Type III Clear 7.5 ML	247 Lacs	250
28.	Glass Vials Type III Clear 10 ML	13 Lacs	150
29.	Glass Vials Type III Clear 15 ML	33 Lacs	250
30.	Glass Ampoules Amber Type I 3 ML	13 Lacs	150
31.	Rubber Stoppers Natural Green/Brown 20 MM.	116 Lacs	200
32.	Rubber Stoppers Grey Butyl 20 MM	178 Lacs	250

TENDER OPENING DATES : (A) SL. NO. 1 TO 12 15.6.1992 (B) SL. NO. 13 TO 23 16.6.1992 (C) SL. NO. 24 TO 32 17.6.1992

TERMS AND CONDITIONS:

1. Tenders are to be sent separately for each item.
2. Item-wise tender documents along with specifications etc. can be obtained on payment of tender fee stipulated against each item, by a crossed Demand Draft/Bankers Cheque, drawn in favour of "Karnataka Antibiotics and Pharmaceuticals Limited, Bangalore", or by Cash, indicating item number and description of the item. "Request for tender documents" shall also be boldly superscribed on the envelope. No other mode of payment will be accepted.
3. Tender documents shall be open for sale on all working days with effect from 15.05.1992 to 01.06.1992. Tender documents will be sent by Rigistered Post. The company takes no responsibility for delay or loss or non-receipt of any tender documents sent by post.
4. Tenders shall be accepted till 14.00 hours on the Tender opening dates as shown above and shall be opened immediately on the same day in the presence of such of the tenderers who are present and wish to participate in the tender.
5. Tenders may be sent by Regd. Post. The Company takes no responsibility for delay or loss or non-receipt of any tender documents sent by post.
6. Offer from actual manufacturers only will be considered. D G S & D rate contract holders will be preferred. Authorised distributors/Stockists may also quote, provided they attach a certificate from their principals to the effect that they are the authorised distributors/stockists, without which the quotation is likely to be rejected without any further correspondence on the subject.
7. Serial number of the item with description and Tender Opening date shall be superscribed on the tender.
8. Tender documents are non-transferable.
9. The offers received without complying with any of our terms will be rejected forthwith without any further reference.
10. The Company reserves the right to accept any or part of the tender without assigning any reasons whatsoever.

MANAGER - MATERIALS

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Caustic soda

Pt. Wiros Konsumindo Pratama, Attention: Soni Sudarmadji, Jl. Orpa 64-66, P.O. Box 3564, Jakarta, Indonesia. Tel: 6902320; Fax: 6902321; Telex: 42969 WIROS IA.

Caustic soda all types (beads, flakes and liquid 50% basic)

CMC Group International, 9300 Northgate, Boulevard, No. 241, Austin, TX 78758, United States. Tel: 512-3394401; Fax: 512-4599558.

Antiophidic lyophilized sera; human albumine and globulin

Laboratorios Probiol Ltda, Diagonal 183 No. 41-71, P.O. Box: 8001, Santafe de Bogota, D.C., Colombia. Tel: 571-6711023, 571-3412666; Fax: 571-6711066.

Pharmaceutical goods, veterinary medicaments

Laboratorios Farvesa S.A., Attention: Jose Virreira, Gerente Commercial, P.O. Box: 140106, Santa Beartriz, Lima, Peru. Fax: 710732.

Pigments, Inks

Toyo Ink America Ind., 910, Sylvan Ave., Englewood Cliffs, NJ 07632, United States. Tel: 201-5688660; Fax: 201-5692455; Telex: 135140 TOYAINK EGWD.

Paints

Jiri Rumi, Placa del Treball 2, 3-4, 08222 Terrassa (Barcelona), Spain. Tel: 93-7853633.

Dextrins

Companhia Lorenz, Rua Sao Paulo, 3068, Itoupava Seca, 89030 Blumenau, Santa Catarina, Brazil. Tel: 473-232988; Telex: 473323 IFCL BR.

Thinner for acrylic and nitrocellulose lacquers

Dalca, Attention: Ramon Burges M., President, Urb. Industrial El Recreo, P.O.Box: 621, Valencia, Venezuela. Tel: 5841-379022; 5841-379327; Fax: 5841-379603; Telex: 45243.

Ion exchange resins for treatment of water used in boilers, or to remove salts from water used in chemical plants, refineries, steel works, etc. or to treat effluent from these plants.

NCP Aci, Attention: A. Strivens, Power Street Industries East, P.O. Box: 677; 1400 Germiston, South Africa. Tel: 2711-825330, 2711-8733252; Fax: 11-8739676.

Phosphoric acid, potassium sulphate, urea

Sticks Trading C.C., Attention: Ahmed S. Izmail, P.O. Box: 42707, Fordsburg 2033, South Africa. Tel: 11-8544058.

Manganese sulphate

Industrias Sulfamex S.A. de C.V., Av. Hidalgo No. 4410-406, Piso 4°, Col. Sierra Morena 89210, Tampico, Mexico. Tel: 075212-170721; Telex: 14839 ISU ME.

Impure sodium carbonate, colouring matters for textiles and leather

Pt. Wiros Konsumindo Pratama, Attention: Soni Sudarmadji, Jl. Orpa 64-66, P.O. Box: 3564, Jakarta, Indonesia. Tel.: 6902320; Fax: 6902321; Telex: 42969 WIROS IA.

Methyl methacrylate

Chain Fong Co. Ltd., 4th Floor, 44, Roosevelt Road, Sec. 2, Taipei, Taiwan. Tel.: 8862-3972999; 8862-3924166; Fax: 8862-3919957.

Detergents

Yuh Shiang, Ind. Co. Ltd., Rm. 806, 27, Chung Shan N. Road, Sec. 3, Taipei, Taiwan. Tel: 8862-5968069; Fax: 8862-5910772.

Polyamide resin

Permapack Ind., Attention: Nicholas J. Popapa, President, P.O. Box: 948, Pennsylvania 19317-0948, Chadds Fords, United States. Tel: 215-3585621; Fax: 215-3580240.

Titanium dioxide

Andesia Ltda., Carrera 8ª, No. 99-51, Ofc. 405, P.O.Box: 90464, Santafe de Bogota, D.C., Colombia. Fax: 2183675; Telex: 44656 ANDEA CO.

Zinc oxide

Indezin S.A., Attention: Juana Ugaze, Gerente, Republica de Panama 3055, Piso 12, L-27, Lima, Peru. Tel: 427642; Telex: 25272 PRESADEX PE.

ZN Fundiciones C.A., Avenida Dos, Parcela G-24, Zona Industrial de Santa Cruz, Via Santa Cruz, Cagua, Venezuela. Tel: 043-619154, 043-619247; Fax: 043-619630.

Suministros Quimicos, Avenida Principal No. 137, Urbanizacion Los Naranjos, Valencia, Venezuela. Tel: 041-210942; Fax: 041-229308.

Minomet C.A., Parcela 80, Zona Industrial El, Recreo, Valencia, Venezuela. Tel: 041-379829.

Aluminium hydroxide (beads, gel, dry gel and suspension)

Productos Corzo S.A., Attention: Alfredo Cordoba, Gerente General, Camino Real de Xochimilco No. 17, Col. Tepepan 16020, Mexico, D.F., Mexico. Tel: 5-5946955, 5-6760932.

Aluminium chlorohydroxide soln. 50% w/w, USP quality. (Commercial

name: Chlorhimexcol, pharmaceutical grade)

Industrias Mexcol Ltda., Carrera 39B No. 17-04, P.O. Box: 80145, Santafe de Bogota, D.C., Colombia. Tel: 2698069, 2694641; Fax: 2698717; Telex: 41381 METCO CO.

Sulphide, stearic acid, urea

Pt. Wiros Konsumindo Pratama, Attention: Soni Sudarmadji, Jl. Orpa 64-66, P.O. Box 3564, Jakarta, Indonesia. Tel: 6902320; Fax: 6902321; Telex: 42969 WIROS IA.

Potassium nitrate, ammonium nitrate

Sticks Trading C.C., Attention: Ahmed S. Izmail, P.O. Box: 42707, Fordsburg 2033, South Africa. Tel: 11-8544058.

Potassium chloride

Fertiagro, Calle 23B Norte No. 3N-42, P.O. Box: 2374, Cali, Valle, Colombia. Tel: 23-684928; 23-676809.

Fertilisers, herbicides

Pesticidas Nacionales Comanil C.A., Ave. Libertador C/C La Joya, Edf. Unidad Tecnica del Este, Piso 2°, Ofc. 4, Chacao, Caracas, Venezuela. Tel: 2-323994, 2-327907.

Hoechst de Venezuela C.A., Urbanizacion La Trididad, Calle Las Vegas, Edf. Hoechst, Caracas, Venezuela. Tel: 2-933333; Fax: 2-933589.

Fertilisers, fungicides

Shell Quimica de Venezuela C.A., Ave. La Estancia, Centro Banaven, Torre C, Piso 7°, Chuao, Caracas, Venezuela. Tel: 2-916777, 2-925522; Fax: 2-924591; Telex: 25496.

Fertilisers

Monsanto Venezuela C.A., Ave. Francisco Miranda, Edf. Parque Cristal, Torre Este, Piso 8°, Ofc. 8-12, Caracas, Venezuela. Tel: 2-2841184, 2-2842595; Fax: 2-2846214.

Basic dyes

Colorquimica, Calle 14 No. 51-125, P.O. Box: 1633, Medellin, Antioquia, Colombia. Tel: 4-2655565; Fax: 4-265-7570; Telex: 66734 CMDEM.

Fungicides, herbicides

Vencatalyst C.A., Ave. Principal Los Chorros, Edf. Ozalid, Piso 1°, Ofc. 1-A, Los Dos Caminos, Caracas, Venezuela. Tel: 2-361763, 2-354448; Fax: 2-283-9175.

Fungicides

Du Pont de Venezuela C.A., Calle La Guarita, Edf. Los Frailes, Piso 1°, Chuao, Caracas, Venezuela. Tel 2-926022; Fax: 2-929442.

Herbicides

BASF Venezolana S.A., Attention: Roberto Diaz, Multicentro Macaracuay, Piso 10°, Ave. Principal de Macaracuay, Caracas, Venezuela. Tel: 2-2560011; Fax: 2-2563379; Telex: 25143 VC.

EXPORT OPPORTUNITIES

Methyl methacrylate

JKW International, Attention: Ms Maria Wood, 2401, Girard Avenue South, Ste. 2, Minneapolis, MN 55405 2536, United States. Tel: 612-3744126; Fax: 612-3744126.

Urea

Sovtrading International Ltd., Attention: Aleksey Nikonorov, President, Moscu, Russia. Fax: 957-2302884.

Colouring matters for textiles and leather, pigments

Compania Colombiana de Quimicos Ltda., Calle 12 No. 38-62, P.O. Box: 80306, Santafe de Bogota, D.C., Colombia. Tel: 2771411; Telex: 044524 COLQUIMICOS.

Detergents

Eightacre, Attention: Mrs. Donna Murphy, Dovedale House, Wickford Business Park, Hurricane Way, Wickford, Essex SS11 8YB, United Kingdom. Tel: 268561555; Telex: 99429 EIGHTA G.

Caustic soda (beads or flakes, rayon grade 98-99%, packed in plastic bags)

Fabrica de Jabones Patria S.A., C. Batallon Coloradas No. 42, P.O. Box 510, La Paz, Bolivia. Tel: 02-365963, 02-813151; Fax: 02-353534; Telex: 3310 PATRIA BV.

Caustic soda

Rosario Trading, Attention: Oswaldo Mina, Gerente, Espana 1567 Piso 4°,-B, Rosario (2000), Argentina.

Stearic acid

Metal Portuguesa S.A., Attention: Eduardo Prieto, Ave. Dr. Carlos Leal-Casta do, Ribatejo, P.O. Box: 10, 2600 Vila Franca de Xira, Portugal. Tel: 63-26719; Fax: 63-21086; Telex: 13842.

Colouring matters

Adypel Quimica Ltda., Attention: Adaury Maia Dantas, Ave. Brasil, 42401, 2300 Rio de Janeiro, Brazil. Tel: 22808.

Disenoy Color S.A., Los Telares 174-A Ate, Lima, Peru. Tel: 373048, 373049; Fax: 373045.

Gypsum

Concur Trading Ltd., 216, Westbourne Park Road, Londres W11 1EP, United Kingdom.Tel: 71-2431557; Fax: 71-2292037.

Titanium dioxide

Kung Meng Trading Co. Ltd., 3rd Floor, 17, Chung King S. Road, Sec. 3, Taipei, Taiwan. Tel: 8862-3965233; Fax: 8862-3942908.

Paraffin (microcrystalline)

Eximtrade S.A., Attention: Carlos

Arturo Paba Gerente, Av. 15, No. 124-49, Ofc. 704, P.O. Box 103173, Santafe de Bogota, D.C., Colombia. Tel: 2139311, 2152125; Fax: 2151625.

Mangesium oxide, calcium oxide and hydroxide

Hoo Cheng Co. Ltd., 8, Alley 14, Lane 53, Hankow St., Sec. 2, Taipei, Taiwan. Tel: 8862-3145183; 8862-3145184; Fax: 8862-3147288.

Magnesium hydroxide, polyurethane resin

Tung Fook Trading Co. Ltd., P.O. Box: 194, Taipei, Taiwan. Tel: 8862-7521611; Fax: 8862-7521616.

Fertilisers, pesticides

Harvest Co. Ltd., P.O. Box 1733, Taipei, Taiwan. Tel: 8862-7137357; 8862-7137359; Fax: 8862-7131237.

TECHNOLOGY

Anti-inflammable Thermoplastics

Petroquimica Paulista S.A (PEPASA) offers a technology for the production of anti-inflammable polymers, by the use of flame-retarding additives during the extrusion process. According to the company, the following aspects should be monitored during the process in order to guarantee the high material quality: Initial humidity content of polymers to be processed; Mould and injection temperature; Injec tion pressure and speed; Condition o equipment used. The final product i analysed using ultimate load (UL) stan dards. Equipments needed include injectors and extruders. An initia invetment of US$ 2 to 5 million is esti mated for a plant with an annual outpu of 1,000 tonnes. Terms of transfer wil be discussed directly with intereste parties. The company, founded in 1969 has 1,500 employees. For more infor mation, contact: Zoe de Arajo Mon corvo, Petroquimica Paulista S.A (PEPASA), Av. Ver. Alfredo das Neves 1675 CP 1271, Santos, Sau Paulo, Brazil. Tel: (55132) 304319; Fax: (55132) 305613; Telex: (38) 131570.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Hindustan Zinc Ltd., Attn: Sr. Manager (Materials) Zinc-Lead Smelter, Zinc Smelter Post, Visakhapatnam 530 015.	Potassium silicate powder/ syrup	44 MT	VZS/PUR(V)/ 203(92)TR-26	29.5.92
(Tender forms are also available at their offices at Bombay, Calcutta, New Delhi and Hyderabad).				
Mahatma Phule Krishi Vidyapeeth, Attn: The Registrar, Rahuri 413 722, Dist. Ahmednagar (M.S.).	Rate contract for the supply chemicals, glasswares, fertilisers, insecticides, pesticides, lab. equipments, farm machinery implements, & medicines for veterinary use.			20.5.92
National Thermal Power Corporation Limited, Attn: Ch. Materials Manager, Kahalgaon Super Thermal Power Project, P.O. Kahalgaon, Dist. Bhagalpur (Bihar).	Non-ferric alum (pure gr.)	1000 MT	1602217	14.5.92
	Caustic soda flakes (rayon grade)	100 MT	1602218	"
Tamil Nadu Integrated Nutrition Project Attn: Project Co-ordinator Housing Board Complex, 2nd Flr., 48 LB Road, Adyar, Madras 600 020.	Nitrofurazone ointment (25 gram tube) Liquid paraffin (400 ml bot.) Benzyl benzoate emulsion (25% 5-lit jar) Centramol tincture (450 ml bottles) Benedicts sol. (500 ml bottle) Acetic acid IP (bottle)	Around 7600 units	1/TINP(h)/92-93	25.5.92
Visakhapatnam Steel Plant Attn: Asst. General Manager, (Materials Management) Purchase Department, Administrative Building, Visakhapatnam 530 031, A.P.	Caustic soda lye	1000 MT	Pur.2.13.006(a)/ 2123	22.5.92
	Thermosetting phenolic resin	50 MT	Pur.2.13.020/ 2504	"
OFFERS FOR SALE				
Steel Authority of India Ltd., Attn: Dy. Chief Matrls. Manager, (Comml.), Bokaro Steel Plant, Main Administrative Bldg., Bokaro Steel City - 827 001, Bihar.	Ferrous sulphate	4000 MT approx.	CD/92:FS	
MISCALLANEOUS				
Krishak Bharat Co-op. Ltd., Attn: Sr. Manager (Materials), 49-50, Red Rose House, Nehru Place, New Delhi 110 019.	Pre-qualification for the supply of Jute bags and HDPE bags			18-5-92

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
			JNPT (NHAVA SHEVA PORT)	
16/5	G. Petrenko (V-10/92)	Transocean	Odessa; Illyichevsk; Havana (Cuba); Piraeus; Lattakia; Izmir; Mersin; Beirut; Istanbul; Salonika; Alexandria; Limmasol; also Rumania & Bulgaria. And also Afghanistan. (Carting at Kalamboli & Taloja).	18/5
			BOMBAY PORT	
3/5	Makalu (Voy-706)	Greenways	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon; Manchester; Avonmouth; Bremen; Belfast and all Destinations in U.K.; Germany; Switzerland; Austria & Scandinavian Ports. (Carting at F-PD).	6/5
		Arebee/	P. Said; Alexandria; Piraeus; Venice; Trieste; Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Ravenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). (Carting at F.B. No. 3).	
		Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Bremerhaven; Felixstowe; Hull; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Limmassol; Izmir; Mersin; Istanbul; Marseilles; Valencia; Larnaca; La Spezia; Casablanca; Piraeus. (Carting at E-Shed Grain Depot).	
		M.C.S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapest; Russia. (Carting at M.O.D. No. 2).	
		Parekh/	Felixstowe; Hamburg; Bremen; Antwerp; Rotterdam; London; Manchester; Liverpool; Birmingham; Leeds; Glasgow; Aarhus; Copenhagen; Gothenburg; Malmao; Oslo; Larnaca; Limmassol; Piraeus; Istanbul; Izmir; Mersin; Lattakia; Beirut; P. Said; Alexandria. (Crtg. at MOD-1).	
		POL India	Thames Port (London); Manchester; Liverpool; Birmingham; Hamburg; Bremen; Rotterdam; Antwerp; Le Havre; Gdynia; Gdansk; Aarhus; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Other Poland Inland destinations; Genoa; Naples; Valencia; Izmir; Marseilles; Barcelona; Alexandria; Lattakia; Mersin; Damietta; Beirut; Haifa; Ashdod. (Carting at Timber Pond No. 3).	
		J. Kackintosh	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
1/5	Eagle Star	F.F.C. Co.	Jeddah; P. Sudan; Hodeidah; Aqaba. (Carting at Timber Pond No. 1).	6/5
8/5	Lanka Amila (V-22W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	12/5
5/5	Halberstadt (Voy-977)	Trident/P&O/	Jeddah; Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at 12B-1D for Trident). (Carting at T.P. No. 1 for P&O).	8/5
		Merzario/	Jeddah; Ravennah; Venice; Trieste; Ancona; Mersin: Limmassol; Piraeus; Alexandria. (Carting at M.O.D. No. 1).	
		Penguin/	Aqaba. (Carting at M.O.D. No. 1).	
		Patvolk	Aqaba. (Carting at Frere Basin No. 1).	
14/5	Green Island	M.S.P.L.	Assab. (Carting at P/Q-PD).	14/5
15/5	Tibor Szamuely (Rus) (Voy-126 W/B)	Transocean	Illyichevsk; Odesssa; Izmail; Reni (USSR); Russe (Bulgaria); Galatz (Romania); Budapest (Hungary); Bratislava (Czechoslovakia); Pancevo; Belgrade/Beograde (Yugoslavia); Linz; Vienna (Austria); Deggendorff;	16/5

1)	(2)	(3)	(4)	(5)
			Regensborg (Germany). (All ports on River Danube). (Carting at N/O & G-PD).	
30/4	Ocean Barbara	POL India	Hodeidah; Jeddah; Aqaba; P. Said.	6/5
5/5	Vishva Shobha	S.C.I.	Jeddah; Illyichevsk; Odessa.	8/5
5/5	Halberstadt (Voy-977)	P&O/	Dubai; Abu Dhabi; Muscat; Doha. (Carting at Timber Pond No. 4).	8/5
		Spoonbill/	Dubai; Sharjah; Ajman; Umm-Al-Quwain; Ras-Al-Khaimah; Abu Dhabi; Doha; Bahrain; Kuwait; Muscat; Bandar Abbas. (Crtg. at F.B. No. 1).	
		Patvolk/	Dubai; Muscat; Bahrain. (Carting at Frere Basin No. 1).	
		Silvership/	Dubai; Sharjah. (Carting at E-Shed Grain Depot).	
		Penguin/	Dubai; Dammam; Riyadh; Abu Dhabi; Sharjah; Doha; Muscat; Jebel Ali; Bahrain; Kuwait; Bandar Abbas. (Carting at F.B. No. 5 & 6).	
		M.S.P.L./	Dubai; Fujairah; Khorfakkan; Sharjah; Abu Dhabi; Muscat. (Carting at F.B. No. 5 & 6).	
		SDS Corpn.	Muscat; Bahrain; Kuwait; Dubai; Sharjah; Abu Dhabi.	
1/5	Eagle Star (V-085)	F.F.C. Co.	Dubai; Sharjah; Abu Dhabi; Doha; Muscat; Dammam; Riyadh; Bahrain; Kuwait; Bandar Abbas. (Carting at Timber Pond No. 1).	6/5
9/5	Gen. Blazhevich (Voy-20)	Spoonbill/	Dubai; Abu Dhabi; Muscat; Doha. (Carting at F.B. No. 1).	11/5
		Sitara/	Dubai. (Carting at F.B. No. 3).	
		Unimarine/	Dubai; Abu Dhabi; Sharjah; Fujairah; Khorfakkan; Ajman; Doha. (Carting at E-Shed Grain Depot).	
		Merzario/	Dubai; Abu Dhabi; Doha; Sharjah; Muscat. (Carting at M.O.D. No. 1).	
		Seacrest	Dubai. (Carting at T.P. No. 4).	
30/4	Swan	U.L.A.	Dammam; Abu Dhabi.	7/5
29/4	Admiral J (Voy-1)	Preetika	Dubai.	7/5
26/4	Gulf Queen	Preetika	Dubai; Abu Dhabi. (Carting at 7-VD)	7/5
30/4	Sea Star	Worldlink	Kuwait.	10/5
6/5	Fremo Sirius	Sai Ship	Dubai; Bandar Abbas.	9/5
8/5	Al Wakrah	U.L.A.	Dubai; Muscat.	11/5
8/5	Saadi (V-41)	J.M. Baxi	Bandar Abbas; Bandar Khomeini.	12/5
14/5	Hai Lee (V-4/92)	J.M. Baxi	Dubai; Dammam.	18/5
	(V-1)		Cotonou; Douala.	
3/5	Makalu (V-706)	Greenways/	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at F-PD).	6/5
		M.C.S.	Far East & Japan Ports. (Carting at M.O.D. No. 2).	
8/5	Lanka Amila	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama & FCL only Busan; Inchon; Osaka; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	12/5
1/5	Eagle Star (V-085)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong;	6/5
7/5	Eagle Star		Manila; Keelung; Kaohsiung; Main Japan Ports; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at T.P. No. 1).	
5/5	Vega (V-35A/B)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Carting at B. Pier Extn.).	10/5
		M.S.P.L./	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Surabaya. (Carting at F.B. No. 5 & 6).	
		Contfreight/	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports (Only FCL). (Carting at Frere Basin).	
		U.L.A./	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese Ports. (Carting at B-PD).	
14/5	Green Island	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	14/5
2/5	S/o. Nagaland	S.C.I.	Penang; (Singapore); Main Japan Ports.	7/5
12/5	Haldor (Voy-4/92)	J.M. Baxi	Penang.	15/5
9/5	Lyudmila Stal	Transocean	Kobe; Yokohama; Vladivostock.	20/5
3/5	Makalu (Pan) (Voy-706)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sacramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas. Various inland destinations. (Carting at F-PD).	6/5

(1)	(2)	(3)	(4)	(5)
		Marine Trans/	South & Central American Ports. (Carting at E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; New Orleans; Oakland; San Francisco. (Carting at M.O.D. No. 2).	
		Arebee	Halifax; Montreal; Toronto; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas; Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tijuana; Veracruze; Mexico; Sao Francis; Du Sul; Carribbean Central and South American Ports. (Carting at F.B.No. 3).	
1/5	Eagle Star (Voy-085)	F.F.C. Co.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver (B.C.); New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami;	6/5
7/5	Eagle Nova (Voy-064)		New Orleans; Houston; Montreal; Chicago; Atlanta; Philadelphia; Milwaukee; Dallas; Guam; St. Louis; Wilmington (B.C.); San Diego; Indianapolis & Central American Ports; Honolulu. (Carting at Timber Pond No. 3).	12/5
14/5	Green Island (USA) (Voy-3)	M.S.P.L.	Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	14/5
1/5	Eagle Star	F.F.C. Co.	Brisbane; Fremantle; Sydney; Melbourne; Adelaide. (Crtg. at T.P. No. 1).	6/5
2/5	Vishva Nandini	S.C.I.	(Seychelles); P. Louis. (Carting at B. Pier Extn.).	6/5
1/5	Eagle Star	F.F.C. Co.	Colombo; Rangoon. (Carting at Timber Pond No. 1).	6/5
8/5	Shenton	F.F.C. Co./	Colombo. (Carting at Timber Pond No. 1).	10/5
		Silvership	Chittagong; Rangoon. (Carting at E-Shed Grain Depot).	
15/5	Tibor Szamuely	Transocean	Afghanistan. (Carting at N/O & G-PD).	16/5
2/5	Vishva Nandini	S.C.I.	Colombo.	6/5
			KANDLA PORT	
3/5	Al Wakrah	U.L.A.	Dubai; Muscat.	6/5
12/5	Fremo Sirius (Voy-1/92)	Sai Ship	Dubai; Bandar Abbas.	16/5
3/5	Orient Faith (Cont.) (V-919)	Meridian/	Dubai; Muscat; Baghdad; Sharjah; Abu Dhabi; Basrah; Ajman; Fujairah;	6/5
		Worldwide/	Doha; Bahrain; Salallah; Samawah; Umm Qasr; Nafaj; Diwaniyah.	
		Sai Ship/	Dubai; Abu Dhabi; Sharjah; Muscat.	
		O.S.A./	U.S.A.; Far East; Australia; New Zealand Ports.	
		Beacon/	U.S.A.; Mediterranean; Far East; Middle East.	
		Sea Land/	Gulf; U.K. Cont.; U.S. East & West Coast & Med. Ports.	
		U.L.A./	Dubai; Aden; Hodeidah.	
		Merzario/ Velji P.& Son	Gulf; U.K; North Cont.; Scandinavian; Med., U.S.A. & West African Ports.	
		Penguin	Aqaba; Dubai; Dammam; Riyadh; Abu Dhabi; Sharjah; Doha; Muscat; Jebel Ali; Bahrain; Kuwait; Bandar Abbas.	
		Seafreight	U.S.A.; Med.; Far East; Middle East and West Africa.	
8/5	Swan	U.L.A.	Dammam; Abu Dhabi.	11/5
30/4	Tropicana	Sai Ship	Jeddah; Aqaba; P. Sudan.	15/5
26/4	Zamalek	Sai Ship	Dammam.	7/5

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
		BOMBAY PORT	
6/5	Fremo Sirius	Sai Ship	U.S. Gulf
14/5	Green Island (V-3)	M.S.P.L.	U.S.A.
9/5	Planitis	Prudential	Cont.
6/5	Ranger	S.W. & Co.	U.S.A./Canada
8/5	Vishva Parag	S.C.I.	U.K. Cont.
		KANDLA PORT	
12/5	Fremo Sirius (V-1/92)	Sai Ship	U.S.A.

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

PLASTIC MATERIALS IMPORTED BOMBAY (From 1.4.92 To 3.4.92)

PVC RESIN: From Brazil: The Supreme Inds. Ltd., 1,100 Mts., Rs. 1,74,50,323; From Germany: Balakrishna Industries Ltd., 4,800 Kgs., Rs. 1,71,374; Chloride Industries Ltd., 27.5 Mts., Rs. 12,17,668; German Remedies Ltd., 1,000 Kgs., Rs. 10,18,727; From Korea: Caprihans India Ltd., 280 Mts., Rs. 43,46,185; Dimple Overseas Ltd., 51 Mts., Rs. 8,17,410; Mahalchand Motilal Kothari & Co., 221 Mts., Rs. 35,40,745; Selfshine Industries, 170 Mts., Rs. 27,29,110; Trimurti Foods and Pharmls., 119 Mts., Rs. 19,08,607.

PVC RESIN: From UK: Kalpana Mercantiles Ltd., 32 Mts., Rs. 4,77,938; From USA: Pittie Industrial Commodities, 180 Mts., Rs. 23,61,111; From USA: Pittie Steels P. Ltd., 100 Mts., Rs. 13,13,392; Wavin India Ltd., 85 Mts., Rs. 11,65,670.

POLYVINYL PYRROLIDONE: From USA: Bombay Pharma Products, 998 Kgs., Rs. 2,35,981.

MATERIALS IMPORTED BOMBAY (From 6.4.92 To 8.4.92)

ACRYLAMIDE: From Japan: Colour Chem Ltd., 15,000 Kgs., Rs. 5,98,902; HMG Industries Ltd., 120 Nos. Rs. 1,19,780; Kamdar Spokes Mfg. Co., 7,500 Kgs., Rs. 2,88,360; Paper Plast, 4,000 Kgs., Rs. 1,53,793; Parekh & Co., 5,000 Kgs., Rs. 1,92,240.

ALKYLAMINES: From Japan: Serene Dyestuff Inds. Ltd., 1,020 Kgs., Rs. 1,68,272.

ALUMINIUM OXIDE: From USA: Grindwell Norton Ltd., 1,996 Kgs., Rs. 2,33,902.

2 B ACID TECH: From UK: Indian Dyestuffs Inds. Ltd., 1.969 Mts., Rs. 3,15,871.

BENTHIOCARB TECH: From Japan: Pesticides India Ltd., 16,720 Kgs., Rs. 15,79,093.

BENTONITE: From USA: Pioma Chemicals, 2,993 Kgs., Rs. 5,33,041.

BENZALKONIUM CHLORIDE: From Germany: Chempure, 250 Kgs., Rs. 30,109.

BISPHENOL-A: From Japan: Electrical Controls & Systems, 8 Mts., Rs. 2,55,532; Synthetics & Polymer Inds., 16,000 Kgs., Rs. 4,87,403.

BROMINE LIQUID: From Netherlands: Gujarat Insecticides Ltd., 11,339 Kgs., Rs. 4,98,945.

BROMO BENZENE: From Italy: Hindustan Ciba Geigy Ltd., 8,000 Kgs., Rs. 6,76,685.

BROMOTRIFLUOROMETHANE: From USA: Achinta Trading, 367 Kgs., Rs. 1,53,524.

BUTYL ACRYLATE MONOMER: From Japan: Metro Enterprises, 5,400 Kgs., Rs. 1,67,692.

CALCIUM CARBONATE: From Singapore: Mittal Meditex P. Ltd., 997.90 Kgs., Rs. 62,435; From USA: Surya Roshni Ltd., 5.8 Mts., Rs. 8,90,303.

CALCIUM CYANAMIDE 63% MIN: From Japan: Gujarat Insecticides Ltd., 40 Mts., Rs. 7,80,791.

CALCIUM PHOSPHATE: From USA: Surya Roshni Ltd., 12.8 Mts., Rs. 7,37,524.

CETYL ALCOHOL C-16: From Germany: Kantilal Manilal & Co., 2,000 Kgs., Rs. 12,398.

CHLOROTRIFLUOROMETHANE: From USA: Achinta Trading, 65 Kgs., Rs. 69,422.

COUMARONE INDENE RESIN: From Germany: Precision Rubber Industries P. Ltd., 3,000 Kgs., Rs. 1,45,057.

2-CYANOPYRAZINE: From Japan: Orgo Pharm Chem., 1,400 Kgs., Rs. 12,42,945.

DICALCIUM PHOSPHATE: From USA: Hindustan Copper Ltd., 6.123 Kgs., Rs. 4,48,232.

DICARBOXYLIC ACID: From Germany: Hindustan Ciba Geigy Ltd., 16,000 Kgs., Rs. 4,25,076.

DIETHANOLAMINE: From Japan: R.R. Enterprises, 16,380 Kgs., Rs. 4,55,379.

DIMETHYL ACETAMIDE: From Germany: Cepham Laboratories, 3,000 Kgs., Rs. 19,155.

DIMETHYL FORMAMIDE: From Japan: Ranbaxy Laboratories Ltd., 9,120 Kgs., Rs. 2,68,208.

2,4-DINITRO 6 SEC-BUTYL

PHENOL: From France: Synthetic & Chemicals Ltd., 1,000 Kgs., Rs. 1,27,716.

DL 2 AMINOBUTANOL: From Germany: Cadila Laboratories Ltd., 15,210 Kgs., Rs. 37,77,346.

DL MALEIC ACID: From Japan: Pioma Industries, 35 Mts., Rs. 15,36,957.

DODECYL BENZENE SULFONIC ACID: From USA: Gujarat Apar Polymers Ltd., 4,790 Kgs., Rs. 2,82,272.

EPICHLOROHYDRINE: From Germany: Anand Organics P. Ltd., 8,280 Kgs., Rs. 3,23,246.

ETHOXY METHYLENE DIETHYL MALONATE: From France: E. Merck India Ltd., 3,960 Kgs., Rs. 15,67,880.

ETHYLENE VINYL ACETATE: From Germany: Universal Cables Ltd., 2,000 Kgs., Rs. 2,18,858; From USA: Hindustan Inks & Resins Mfg. Co., 2,000 Kgs., Rs. 1,31,339.

2 ETHYL HEXANOIC ACID: From USA: Alpha Chemie, 26,784 Kgs., Rs. 8,99,088.

GLYCERINE CRUDE: From Egypt: Godrej Soaps Ltd., 199.524 Mts., Rs. 31,10,387.

HEXACHLOROCYCLOPENTADIENE: From USA: Bharat Pulverising Mills Ltd., 8,890 Kgs., Rs. 4,81,153.

2 HYDROXY ETHYL METHACRYLATE: From Japan: Kroslink Products, 400 Kgs., Rs. 41,436.

HYDROXY PROPYL METHYL CELLULOSE: From Japan: Glaxo India Ltd., 500 Kgs., Rs. 3,54,905; From UK: Bab Pharma P. Ltd., 100 Kgs., Rs. 50,322; Chemicircle Pharmls. P. Ltd., 600 Kgs., Rs. 3,16,093.

IODINE 99.5% PURE: From China: Atul Products Ltd., 7,200 Kgs., Rs. 19,48,427.

IODINE CRUDE 99.5%: From Japan: Micro Laboratories, 1,000 Kgs., Rs. 3,01,669; Nirav Laboratories P.

td., 1,000 Kgs., Rs. 3,01,669; From ingapore: Gayatri Labs. P. Ltd., 2,000 gs., Rs. 5,76,720.

ISO BUTYRIC ACID: From Gerany: Krupa Scientific & Indl., 4,000 gs., Rs. 2,19,622; Organic Synthesis, ,900 Kgs., Rs. 89,178.

ISOCYANATE: From Germany: Autofit P. Ltd., 4,750 Kgs., Rs. 5,47,885.

ISO VALERIC ACID: From Germany: Organic Synthesis, 1,020 Kgs., Rs. 1,31,880.

L-BASE (ACTIVE AMINODIOL): From China: Themis Agencies, 500 Kgs., Rs. 11,56,841.

LITHIUM ACETATE DIHYDRATE: From USA: The Bombay Dyeing & Mfg. Co., 907.19 Kgs., Rs. 1,82,027.

LITHIUM BROMIDE ANHYDROUS: From Germany: Glaxo India Ltd., 500 Kgs., Rs. 2,56,817.

LITHIUM HYDROXIDE MONOHYDRATE: From USA: Indian Oil Corpn. Ltd., 28,800 Kgs., Rs. 40,15,371.

LITHIUM OXYSTEARATE: From Germany: OKS Speciality Lubricants P. Ltd., 20 Kgs., Rs. 5,712.

METHYL DICHLORO ACETATE: From Japan: Themis Agencies, 5,000 Kgs., Rs. 32,438.

METHYL SALICYLATE: From China: Hindustan Petroleum Corpn. Ltd., 3,950 Kgs., Rs. 4,15,912.

MICROCRYSTALLINE WAX: From Japan: D.K. Traders, 7,020 Kgs., Rs. 2,90,667; From Spain: Delta Corporation, 20 Mts., Rs. 3,63,548.

MONOETHYL ACETO ACETAMIDE: From Japan: Vantech Pesticides Ltd., 16 Mts., Rs. 73,347.

MONOSODIUM GLUTAMATE 99% MIN: From France: R.K. Chemicals, 18,000 Kgs., Rs. 6,60,124.

NAPHTHALENE CRUDE 78.5%: From Canada: Mewati & Co., 46.8 Mts., Rs. 6,50,541.

NAPHTHALENE CRUDE: From Denmark: Amar Dyechem Ltd., 19,604 Kgs., Rs. 23,77,164; Biddle Intermediates P. Ltd., 33 Mts., Rs. 4,09,791; Vivek Dyechem Inds. P. Ltd., 65.430 Mts., Rs. 8,12,750; From France: Colour Chem Ltd., 16,028 Kgs., Rs. 2,20,426.

NAPHTHENIC ACID: From Germany: J. Kirit & Brothers, 3,120 Kgs., Rs. 1,01,503.

NATROSOL: From Netherlands: Mafatlal Dyes & Chem Ltd., 1,000 Kgs., Rs. 1,67,101.

NONYL ALCOHOL: From UK: Synthetics & Chemicals Ltd., 2,064 Kgs., Rs. 1,05,748.

N-BUTYL LITHIUM: From Germany: Indian Oil Corporation Ltd., 1.3 Kgs., Rs. 17,469.

N-DODECYL MERCAPTAN: From Germany: Pidilite Industries Ltd., 170 Kgs., Rs. 49,681.

N-PROPYLETHANOLAMINE: From USA: BASF India Ltd., 2,952 Lbs., Rs. 19,64,398.

OCTA METHYL CYCLO TETRA SILOXANE: From USA: Trichem Enterprises, 1,950 Kgs., Rs. 1,93,201.

OLEYL ALCOHOL: From Germany: Himatlal H. Joshi, 680 Kgs., Rs. 48,868.

PARACHLORO TOLUENE: From USA: Dhanuka Pesticides Ltd., 12,247 Kgs., Rs. 5,27,034.

PARAFFIN WAX: From China: Indian Oil Corpn. Ltd., 144.500 Mts., Rs. 39,23,201; From Japan: Indian Oil Corpn. Ltd., 506.688 Mts., Rs. 13,13,716.

PARAFFIN (NORMAL): From Korea: Reliance Industries Ltd., 3,498.264 Mts., Rs. 4,66,58,451.

PARAFORMALDEHYDE 96% PRILLS: From Spain: Goodlass Nerolac Paints Ltd., 16,000 Kgs., Rs. 2,67,361.

PARA NITRO TOLUENE: From Korea: IPCA Labs Ltd., 16,060 Kgs., Rs. 7,67,785.

PARA TERTIARY BUTYL PHENOL: From Germany: Usha Thermosets P. Ltd., 12,000 Kgs., Rs. 4,98,403; From Korea: Hindustan Polyamides and Fibres, 12 Mts., Rs. 4,36,533.

POLYETHYLENE GLYCOL: From Japan: Wockhardt Ltd., 15,980 Kgs., Rs. 8,06,091.

POLYMETHACRYLATE BEADS: From Germany: Loctite India Pvt. Ltd., 500 Kgs., Rs. 75,274.

POLYSORBATE 80: From France: Glaxo India Ltd., 16,800 Kgs., Rs. 9,63,922.

POLYVINYL ALCOHOL: From Japan: Tribenitechnochem Ltd., 2 Mts., Rs. 1,10,325.

POLYVINYL PYRROLIDONE: From Germany: Procter & Gamble India Ltd., 250 Kgs., Rs. 97,192; From UK: Mercure Pharmls. P. Ltd., 200 Kgs., Rs. 89,725.

PROPIONIC ANHYDRIDE: From Japan: Mehta Pharmaceuticals Inds., 1,620 Kgs., Rs. 1,43,317.

RESORCINOL: From Japan: Anchemco Ltd., 100 Kgs., Rs. 12,215; Chemo India, 500 Kgs., Rs. 61,073; Purolator India Ltd., 400 Kgs., Rs. 48,859.

SILICA FUMED: From Germany: Loctite India P. Ltd., 10 Kgs., Rs. 3,976; Unique Pharmaceuticals Labs Ltd., 960 Kgs., Rs. 2,32,942.

SILICA GEL: From Japan: Delhi E.S.U.I. & F.E. Department, 150 Set, Rs. 73,639.

SILICON DIOXIDE: From USA: Teletube Electronics Ltd., 300 Lbs., Rs. 31,057.

SILICON EMULSION: From Japan: Sonia International Pvt. Ltd., 252 Kgs., Rs. 82,287.

SODIUM LAURYL SULPHATE: From France: Colgate Palmolive (India) Ltd., 33,000 Kgs., Rs. 17,43,002.

SULPHONIC ACID: From France: Lubrizol India Ltd., 99,240 Kgs., Rs. 54,31,262.

SULPHUR INSOLUBLE: From Germany: Metazinc Ltd., 24,800 Kgs., Rs. 14,05,587.

TERTIARY DODECYL MERCAPTAN: From USA: Synthetics & Chemicals Ltd., 13.94 Mts., Rs. 5,62,764.

2 THIOURACIL: From Japan: Grauer & Weil (I) Ltd., 50 Kgs., Rs. 1,23,857.

THIOUREA: From Japan: Hindustan Copper Ltd., 3 Mts., Rs. 1,97,818.

TITANIUM DIOXIDE: From Australia: Asian Paints I Ltd., 35,000 Kgs., Rs. 15,78,587.

TITANIUM DIOXIDE RUTILE: From USA: Kings Plastics, 5,000 Kgs., Rs. 2,36,603; R.P. Shah & Sons, 5,000 Kgs., Rs. 2,36,603.

TRIGLYCIDYL ISOCYANURATE: From Taiwan: Marpol Chemicals Pvt. Ltd., 200 Kgs., Rs. 65,362.

TRIMETHOXY BENZALDEHYDE: From France: Pragati Pharma P. Ltd., 1,500 Kgs., Rs. 9,62,749.

TRIMETHYL PHOSPHATE: From Japan: Sanghi Polyesters Ltd., 220 Kgs., Rs. 70,128.

TRIMETHYL PHOSPHATE 98.5% MIN: From USA: Glaxo India Ltd., 1,505 Kgs., Rs. 1,17,954.

TURPENTINE OIL: From Indonesia: Twin City Organics P. Ltd., 40.8 Mts., Rs. 6,31,222.

VINYL ESTER: From Netherlands: Asian Paints India Ltd., 13,962 Kgs., Rs. 7,43,277.

YELLOW PHOSPHORUS: From China: Excel Inds. Ltd., 111.6 Mts., Rs. 47,03,376.

ZIRCONIUM OXIDE: From China: Scientific Diamonds Ltd., 240 Kgs., Rs. 68,142.

DRUG MATERIALS IMPORTED BOMBAY (From 6.4.92 To 8.4.92)

D-PANTHENOL USP: From Japan: Kushalchand Sons, 250 Kgs., Rs. 1,79,671; Medi Pharma Drug House, 500 Kgs., Rs. 3,55,644.

FURAZOLIDONE BP: From China: Privi Pharma P. Ltd., 1,000 Kgs., Rs. 2,23,277.

LEVAMISOLE HCl BP: From China: Micro Labs. Ltd., 1,000 Kgs., Rs. 7,48,634.

MANNITOL BP 80/USP 21: From China: Dilipkumar & Co., 5,000 Kgs., Rs. 4,28,842; Sevantilal and Sons, 2,500 Kgs., Rs. 2,36,411.

NEOMYCIN BASE BP/IP: From Hungary: Harisons Chemicals, 100 Kgs., Rs. 2,16,853.

PIPERAZINE ANHYDROUS: From Belgium: Ranbaxy Laboratories Ltd., 4,850 Kgs., Rs. 10,87,107.

SULPHADIAZINE BP 88: From China: Malav Agency, 1,300 Kgs., Rs. 3,65,256.

PLASTIC MATERIALS IMPORTED (From 6.4.92 To 8.4.92)

HDPE: From Brazil: Jayashree Polytex Ltd., 50 Mts., Rs. 10,76,655; Plast Fab, 10 Mts., Rs. 2,15,119; Polyolefins Industries Ltd., 1,200 Mts., Rs. 2,65,66,302; Tulsyan Synthetic P. Ltd., 100 Mts., Rs. 21,37,178; From Italy: Kanpur Plastipack Ltd., 48 Mts., Rs. 1,00,793; From Japan: Shreyas Chemicals, 16.5 Mts., Rs. 3,77,709; TPI India Ltd. 32.100 Mts., Rs. 5,85,208; Urvakunj International, 37 Mts., Rs. 9,65,894; From Korea: APA Packaging P. Ltd., 16,000 Kgs., Rs. 3,51,560; B.M. Plastochem, 16 Mts., Rs. 3,46,720; Dhiraj Polypack Pvt. Ltd., 32 Mts., Rs. 7,03,204; Fibro Plast Corporation, 64 Mts., Rs. 13,67,912; 80 Mts., Rs. 17,09,890; 96 Mts., Rs. 20,51,868; Gilt Pack Ltd., 90 Mts., Rs. 19,54,481; Gujarat Ambuja Cements Ltd., 160 Mts., Rs. 35,10,867; Gupta Plastic Udyog, 16 Mts., Rs. 3,37,787; Hico Enterprises, 60 Mts., Rs. 15,12,530; Jamnadas Murlidhar Jaisingh, 96 Mts., Rs. 20,52,921; Jyoti Impex, 40 Mts., Rs. 8,42,050; Jyothi Laboratories, 144 Mts., Rs. 30,42,487; Kanpur Plastipack Ltd., 45 Mts., Rs. 9,75,214; Lakshman's Plastics P. Ltd., 16,000 Kgs., Rs. 3,51,135; Metro Dye Chem Ltd., 48,000 Kgs., Rs. 9,23,021; Modern Polyplast, 16 Mts., Rs. 3,51,482; Multilayer, 16 Mts., Rs. 2,96,243; Naman Plastic Processor P. Ltd., 16 Mts., Rs. 3,75,126; Nylofil Enterprises, 16 Mts., Rs. 3,32,154; Polychroic Industries, 16 Mts., Rs. 3,51,140; Pradhan Laminators Ltd., 45 Mts., Rs. 9,82,483; Priya Galvanising Pvt. Ltd., 16 Mts., Rs. 3,41,810; Raheja Mercantile Corpn., 32 Mts., Rs. 6,54,824; Raj Packwell Ltd., 32 Mts., Rs. 6,24,680; Rama Petrochemicals Ltd., 160 Mts., Rs. 34,45,410; Rishi Packers Ltd., 48 Mts., Rs. 10,41,463; Sindhu Plastics (India) 16 Mts., Rs. 3,28,062; Subham Polymers Ltd., 80 Mts., Rs. 1,75,691; Vishal Plastics, 48 Mts., Rs. 10,11,030; From Saudi Arabia: Bright Brothers Ltd., 68.60 Mts., Rs. 13,79,632; Calcutta Rope Stores, 17.15 Mts., Rs. 3,32,228; Cello Plast, 33 Mts., Rs. 7,07,592; Elite Industries, 17.15 Mts., Rs. 3,32,228; King Plastics, 24.75 Mts., Rs. 4,53,834; From Singapore: Niranjan Plastics, 17 Mts., Rs. 3,78,224; From Saudi Arabia: Okay Inds., 17.15 Mts., Rs. 3,44,908; Shalimar Pack, 51.45 Mts., Rs. 11,10,808; VIP Industries Ltd., 99 Mts., Rs. 19,32,457; From Thailand: Manish International, 32 Mts., Rs. 7,32,888; Sindhu Plastics, 17 Mts., Rs. 3,66,244; From USA: Anuradha Plas & Tex Inds., 20 Mts., Rs. 3,73,769; Bothra Inds.,

0 Mts., Rs. 3,84,480; Euro Polythene Pvt. Ltd., 40 Mts., Rs. 6,92,064; Jkamal Enterprises, 40 Mts., Rs. 4,68,960; Kanpur Plastipack Ltd., 49.488 Mts., Rs. 10,30,066; From UAE: Mukut Plastic Pvt. Ltd., 17.150 Mts., Rs. 3,90,558; From USA: Plastochem Industries, 10 Mts., Rs. 1,86,838; Polychroic Industries, 20 Mts., Rs. 3,75,158; Pushpa Impex P. Ltd., 17.5 Mts., Rs. 3,26,068; Rasiklal Mansuklal & Co., 35 Mts., Rs. 6,52,138; Safeguard Packaging Systems P. Ltd., 40 Mts., Rs. 7,68,960; Subhash Corpn., 35 Mts., Rs. 6,52,138; From Yugoslavia: Ravi International, 5 Mts., Rs. 1,14,233; Ridhi Synthetic Traders Ltd., 5 Mts., Rs. 1,14,216.

LDPE: From Yugoslavia: Arun Investments Corpn., 10 Mts., Rs. 2,22,428.

LLDPE: From Canada: Mak Impex Chemicals P. Ltd., 75 Mts., Rs. 12,01,710; From Korea: Bharat Vijay Mills Ltd., 16 Mts., Rs. 3,49,534; From Saudi Arabia: Indian Petrochemicals Corpn., 173.250 Mts., Rs. 34,53,535; 891 Mts., Rs. 1,93,42,136; VIP Industries Ltd., 198 Mts., Rs. 40,69,872; From Singapore: Duro Pack Ltd., 16 Mts., Rs. 4,25,886; From USA: EPC Industries Ltd., 33 Mts., Rs. 9,81,208; Kailash Structurals P. Ltd., 17.5 Mts., Rs. 4,41,835.

POLYCARBONATE: From Germany: Futura Poly Containers, 15,000 Kgs., Rs. 12,19,986; From Japan: Urvi Plastics Industries, 17,000 Kgs., Rs. 13,07,232.

POLYETHER POLYOL: From Belgium: Autofit P. Ltd., 3,440 Kgs., Rs. 1,98,392; 7,955 Kgs., Rs. 2,58,799.

POLYETHYLENE: From Sweden: Asian Cables & Inds. Ltd., 41,475 Kgs., Rs. 15,81,510.

POLYETHYLENE WAX: From UK: Bombay Paints Ltd., 170 Kgs., Rs. 21,110.

POLYPROPYLENE: From Australia: Plastics and Metals P. Ltd., 16,250 Kgs., Rs. 3,26,808; VIP Inds. Ltd., 15 Mts., Rs. 3,77,086; From Belgium: Ishwar Arts, 30 Mts., Rs. 6,21,084; Ishwar Ashish Plastics P. Ltd., 15 Mts., Rs. 3,10,542; Rajasthan Synthetic Ltd., 60 Mts., Rs. 1,34,438; From Brazil: Alpha Packaging Pvt. Ltd., 360 Mts., Rs. 74,19,945 Ashirvad Polysac P. Ltd., 50 Mts., Rs. 10,52,405; Associated Brothers, 50 Mts., Rs. 10,39,005; From Brazil: Bajaj Exports P. Ltd., 50 Mts., Rs. 9,65,055. Bajaj Marketing Services, 50 Mts., Rs. 9,65,055; Bajaj Plastics Ltd., 715 Mts., Rs. 1,38,00,289; Diamond Polyplast P. Ltd., 50 Mts., Rs. 10,39,500; Diamond Polyprints, 30 Mts., Rs. 6,23,701; Ellora Chemical Works, 18 Mts., Rs. 3,61,394; Fibro Plast Corpn., 45 Mts., Rs. 9,35,105; Garware Wall International, 5,000 Kgs., Rs. 1,03,449; Jajodia Industries Ltd., 50 Mts., Rs. 9,90,776; Pooja International, 50 Mts., Rs. 10,38,024; Sapana Polyweave P. Ltd., 20 Mts., Rs. 3,88,990; Shree Polymers & Packers P. Ltd., 180 Mts., Rs. 36,33,847; Vishal Plastics Industries, 12 Mts., Rs. 25,98,466; Wimco Pen Company, 50 Mts., Rs. 9,79,195; From Hungary: Associated Brothers, 105 Mts., Rs. 22,04,846; Associated Plastic Industries, 105 Mts., Rs. 21,94,846; Fibro Plast Corpn., 105 Mts., Rs. 22,05,046; Naresh Paper Bags Co., 15 Mts., Rs. 3,14,978; From Japan: Madhya Pradesh United Polymers, 15 Mts., Rs. 6,43,265; From Korea: Ashirwad Poly Plast, 15.5 Mts., Rs. 3,45,411; Asian Electronics Ltd., 2,000 Kgs., Rs. 8,55,469; Diamond Polyplast P. Ltd., 15 Mts., Rs. 3,16,307; Hico Enterprises, 23 Mts., Rs. 4,63,383; Kamlax Polytex P. Ltd., 31,000 Kgs., Rs. 6,27,340; Kosmo Packers, 15.500 Mts., Rs. 3,42,417; From Brazil: Nidhi Plastics P. Ltd., 50 Mts., Rs. 10,38,955; From Korea: Shakti Industries, 46.5 Mts., Rs. 10,22,022; Siddharth Plastics, 31 Mts., Rs. 6,25,384; Sushil Chemicals, 45 Mts., Rs. 9,07,977; Swati Growth Funds Ltd., 31,000 Kgs., Rs. 6,25,950; From Norway: Metro Dye Chem (India) Ltd., 45,000 Kgs., Rs. 8,15,616; From USA: Cosmo Films Ltd., 102 Mts., Rs. 23,97,952.

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The Fascinating Science of Glycobiology

FOR years, genes and proteins enjoyed the scientific limelight, while complex sugars attached to the pro-eins were virtually ignored. Sugars were stereotyped s mere fillers, inactive chemicals, sidekicks to the bio-ogical stars in the grand scheme of life.

But a quiet revolution is changing all that. Biologists re now unlocking the sweet secrets of large sugar hains attached to proteins known as glycoproteins. Jnderstanding the role of these sugars is helping esearchers to find new treatments and diagnostics for number of diseases.

Glycobiology — the study of the role of sugars in bio-ogical processes — is a newly-emerging area of science ust beginning to attract the interest of the pharmaceut-cals industry. Yet it is already showing new approaches o the treatment of some of mankind's most stubborn diseases, and could rival some of the better known areas of biology in the quest for new drugs.

The term was coined five years ago by Prof. Ray-mond Dwek, Head of Oxford University's Institute of Gly-cobiology, a collaborative research centre with the US pharmaceuticals group Searle. In fact Searle, and its parent company Monsanto, are amongst the first to rec-ognise potential for drug-discovery via glycobiology.

The Institute of Glycobiology, whose new laborator-es were opened recently, is the largest of only a hand-ull of scientific groups working in this area in the world. t houses some 60 researchers, including scientists from Searle's US laboratories, who concentrate on applying esearch findings to the development of novel therapeu-c agents. It was funded by grants of £2.9m ($5.2m) rom Searle and £0.8m from Oxford University.

The Institute's work centres on the many proteins nvolved, in particular, with immunological diseases, hich are glycosylated, that is coated in oligosaccha-des or sugar molecules. Generally, for the same glycoprotein, a number of different glycoforms exist, as the number and position of the individual oligosaccharides can vary.

Dwek explains that the Institute's research is based on the observation that many protein glycosylations have a fundamental role in many cell biochemical processes. Glycosylation seems to extend the range of properties of the protein, say for example the immune system messengers or cytokines, and can within a given environment determine or control its function. Furthermore, a change in the relative population of the different glycoforms appears to be associated with some disease types, either directly as a result of the pathogenic process or in response to it.

Searle is a major player in the emerging field of glycobiology, the study of the role sugars play in life processes. Searle has a unique partnership to study glycobiology with Oxford University in England. Already, the joint research has produced a diagnostic kit for rheumatoid arthritis and a drug for AIDS (acquired immune deficiency syndrome).

The benefits to the academic researchers are that they have resources that they wouldn't have otherwise. They can do more work and move more quickly. Sugars play a key role in body processes. They serve as the communications link between cells. When cells use their glue-like sugars to stick to one another, their sugary markers indicate whether they are connecting with friend or foe.

"The immune system functions to a large degree through recognition of complex sugars," says a scientist. Sugar-coated bacteria and viruses operate by using their own receptors to try to sweet talk their way past the immune system's sentinels. Usually the immune system fends off invaders whose sugars set off an alarm. But occasionally, the invaders get past the guardians and cause disease.

A case in point is the AIDS virus, which Dwek describes as very heavily glycosylated. Glycosylation is the process in which sugars are added to proteins. Marr says researchers have found a compound, butyl DNJ (or SC-48334), that "malforms", sugars on the AIDS cell's membrane so that the membrane cannot attach to its usual target receptors on a healthy cell.

"Searle took up the reins of that research and essentially took all the gambles. It did all the things that you'd expect a drug company to do," Dwek says. The move from discovery to testing usually takes years, but in only one year, SC-48334 moved from the lab to testing in AIDS patients. Butyl DNJ has been found to give more punch to AZT, the first antiviral drug approved to treat AIDS.

Glycobiology research has also created a diagnostic test for rheumatoid arthritis, an immune system disease in which the body attacks its own joints. Dwek and his colleagues found that a certain sugar, galactose, is missing from antibodies of patients with rheumatoid arthritis.

Dwek says it is not clear whether the sugar defect is the cause or the result of the disease. But the new test allows researchers to monitor the progress of the disease as well as the effectivness of treatments — activities that were not possible previously. By understanding which sugars are missing, Dwek says, biologists may some day learn to "plug the hole" with other sugars.

Marr, Dwek and Colin Sanderson, the immunological researcher who heads Searle's team at Oxford, say that many other diseases may be heavily influenced by sugars. Their list includes a strain of flu that can be life-threatening to the elderly and other high-risk groups; hepatitis B, a liver disease spread by sexual contact and blood products; asthma, a lung disorder marked by wheezing and coughing; toxemia, a kind of blood poisoning that is potentially fatal to pregnant women and their babies; and metastatic cancer, cancer that spreads from one site to another.

Sanderson's special interest is asthma. He says asthma is caused by a specialized white blood cell known as an eosinophil. Eosinophils used their sugary receptors to attach to blood vessels, which eventually carry them into the lungs. There, the eosinophils stick like barnacles. The toxins that they usually release to attack invading organisms instead attack the lungs. What follows is the wheezing, coughing, excess mucus and other symptoms of asthma.

Research is still in the earliest stages. But Sande son says it may be possible to develop drugs that bloc the areas the white cells ordinarily latch onto. Marr say many pharmaceutical companies are coming to vie glycobiology as a potentially fruitful area for new drugs

The drug, *Oxaid* (butyl-DNJ), is in development b Searle, as an adjunct treatment to zidovudine in HI infection. The compound is a modified glucose 'mimic which is absorbed through the body's normal transpo systems. As such it is incorporated into cells, which ar apparently unable to distinguish it from glucose. Onc inside, it appears to interfere with the metabolism o sugars in the viral coat of HIV, altering its ability to infec new cells. The surface molecules act as spikes tha enable the HIV to fasten to healthy cells, leading to thei infection and destruction.

Therefore butyl-DNJ has a different point of action t the currently approved AIDS-drugs such as *Retrovir* an *Videx,* which inhibit the expression of a viral enzyme reverse transcriptase. This in turn inhibits the replica tion of the virus, once it has penetrated and taken ove a cell.

Searle hopes butyl-DNJ will reduce the ability of th HIV to infect new cells, and therefore can be used i conjunction with reverse transcriptase inhibitors with a 'at least' additive effect. So far, and for ethical reasons Searle is studying the drug in conjunction with alread approved AIDS therapeutics. However, the body of med ical opinion has been moving in favour of combinatio treatments for AIDS for some time, as this offers a route to lower dosages (and hence fewer side effects of these quite toxic compounds) and also the likelihood of an resistance developing.

One side-effect of butyl-DNJ thus far encountered is that of diarrhoea, caused as a result of the way in which the drug is absorbed. Searle is developing a pro-drug a chemically modified compound which is metabolised into the active form, as a route to avoid this, which i hopes will enter the clinic mid-1992. Results are due to be published for the current trials of butyl-DNJ in spring 1992.

The three other projects at the Institute are less advanced, and aimed at elucidating the function of glyc oforms in asthma, rheumatoid arthritis and preeclamp sia (toxaemia in pregnancy). The asthma research group is looking for a way to prevent eosinophils, the white blood cells which cause the damage in the disease, from entering the lungs. Already, it has identified the growth factor which controls the production of eosinophils

termed Interleukin-5. This is highly glycosylated and represents the key target for screening therapeutics which could prevent adhesion, and stem the production of eosinophils to control the disease.

In the area of rheumatoid arthritis, research centres on elucidating the role of various cytosines in the disease. Recently, a biochemical marker has been identified which could help in this process. It has been established that sufferers have raised quantities of a particular set of oligosaccharides deficient in galactose, known as GO sugars, present in serum immuno gamma globulin (IgG). Raised GO-deficient sugar levels have been found to be present only in rheumatoid arthritis (and a few related diseases) after screening some 40 disease types.

Another project is to determine the association with organ damage of an unusual variant of a glycoprotein, which is found to be in excess in placental cells in pre-eclampsia. In this way, it is hoped that a target for modifiers can be found, which would protect the foetus from attack by the mother's immune system in pre-eclampsia.

Larger term, it is hoped that the application of structural and functional information gained from investigation into the role of cell surface sugars, can be used in the development of sugar mimics which may modify the immune response in other situations. These could include immuno-suppressive agents, to prevent organ transplant rejection, and immunomodulators, compounds which can augment the body's immunological defence mechanism for destroying cancer cells.

What will the next five to 10 years hold for glycobiology? Dwek reflects:

"Will it lead to better success in attacking viruses? I believe it will.

"Will it lead to a better way to fight cancer? That's almost true right now, because we know that in cancer, the cell surface produces very unusual sugars.

"Better management of diseases such as rheumatoid arthritis is clearly going to be one of the things that comes from it."

Such are the sweet dreams of glycobiologists.

— T.P.S. RAJAN

CHEMARENA

S.L. VENKITESWARAN

Du Pont's plans for the future

The recession, though mild in USA has already resulted in cutback and cost cutting efforts with several thousands retrenched or in voluntary retirement with benefits. R&D efforts however continue without cuts for providing the "technical transfusion" for the industry which depends heavily on innovations. The plans for the future involves careful selection of items or areas for cutbacks or growth and also globalisation of capacity to the extent feasible. Du Pont's plans lay emphasis on (1) fluorochemicals (including polymers), (2) white pigments, (3) special intermediates, (4) speciality chemicals and (5) renewable resources products. Du Pont's chemicals suffered a dip of 5% to $ 3.48 billion last year. Du Pont presently is reported to have 30% of sales outside of USA and is set to expand this by a large venture in Singapore and other countries but (little in India) to reach a level of 50% of sales outside USA.

Among the build up of overseas capacity are (1) THF in Europe with possible production of maleic anhydride, also, (2) TiO_2 in Taiwan and South Korea, (3) adipic acid in Singapore, (4) H_2O_2 in Venezuela, New Zealand and Indonesia and (5) adiponitrile in France. Some of these are joint ventures with local partners.

In the case of TiO_2 the capacities contemplated are 60,000 TPA each in Taiwan and South Korea but nothing in India with its ilmenite resources even though Du Pont imports beneficiated rutile grade from India. Du Pont is on top in this item with nearly a million tonnes and with the best and low cost chloride based technology.

There has been talk of hydrogen peroxide in India for some years now with no progress and other ventures have taken shape meanwhile. Du Pont and their local partner have yet to shed their doubts.

Adipic acid with a capacity of 100,000 TPA is to be set up in Singapore even if nitric acid is to be imported and will form the base for the massive efforts to push nylon 66 into the Asia/Pacific market. Joint venture in India for nylon 66 has been pending for some years on the question of import of intermediates — both adipic acid and HMDA and Du Pont has shown no interest to go basic. Du Pont and Rhone Poulenc of France are said to be on the track of new technology at lower cost for adipic acid and adiponitrile — may be based on butadiene perhaps.

Du Pont is also ahead in the race for chlorofluorocarbon substitutes and are building plants for a substitute, HFC 134a. Du Pont is active in products from renewable resources and waste like oat hulls and cheese whey in association with Con Agr for products like polylactide, choline chloride etc. Polylactide is a biodegradable polymer based on lactic acid and Con Agr is building a plant for lactic acid from whey at a cost of $20 million. Apart from packaging, polylactide is said to be useful for drug delivery systems (transdermal) and implants.

It is a matter of regret that the two top chemical giants of USA have not seen fit or be attracted for projects in India. The other giant Union Carbide which came in with great enthusiasm in the early sixties is now totally departing from India, even from their lucrative battery business — a sequel to Bhopal disaster. Monsanto came in for a rubber chemicals project but fared poorly and sold off to Polyolefine Industries Limited. ICI came in a small way with explosives, caustic soda, BHC and on the polyethylene based on ethyl alcohol and then rubber chemicals and polyester fibres and fertilisers. They have not done much in pharmaceuticals in India. Glaxo also is an early entrant and well established in diverse products. The big three of West Germany have sizeable activity in India though not on a scale which could make a big impact. The Swiss multinationals Ciba-Geigy and Sandoz have large operations in the field of dyestuffs, agrochemicals and some pharmaceuticals. Shell International came up as partners in a petrochemicals complex.

There has been great opportunity for profitable operations in India but the dissociation and enterprise have been at a rather low key. Perhaps the new policy may promote more ventures in India's chemical sector by the world leaders.

Mobil's process for oxygenate ethers for gasoline

The last decade has seen the spectacular growth of MTBE as an octane booster to substitute for TEL addition to gasoline. The pressure on removal of lead additives and stricter control on emissions from autos has led to the use of MTBE and tertiary butyl amyl ether or alcohols as standard additives for gasoline. MTBE is based on etherification of methanol by isobutylene generally derived from refinery cat-cracker gases or from naphtha cracker C4 fraction after recovery of butadiene. The ethyl ether ETBE is equally effective but ethanol is more costly than methanol and more useful as a direct gasoline additive. The supplies of isobutylene is also difficult as sources are limited but it can be obtained by isomerisation of n-butane with dehydrogenation. Limitation of C4 has restricted the growth of MTBE to some extent.

Now Mobil have developed a process for the oxygenate ethers directly from the C3-C4 olefines of crackers by reaction with water and avoided the need for methanol or other alcohol. The main product is diisopropyl ether from the propylene component but other ethers are also feasible. This DIPE process converts a mixed stream of refinery cracker gases with a specially developed catalyst. Generally the fraction is being used for alkylates to be blended with gasoline.

The DIPE will have preference now. A rough estimate of cost is said to be 98 cents per US gallon of which the feedstock gases constitute half and operating costs 30 cents. There are expectations of large capacities coming up for DIPE using the refinery gases and not needing an external raw material.

US action in customs duty on some drugs from India

The action under US Super 301 has been imposed by USA and the preference tariff on imports from India is withdrawn on the grounds of non-recognition of patent rights as per TRIPS. India's protest may not have much effect and perhaps our exports of drugs like ibuprofen and many others will suffer. Only recently a representation for antidumping duty on ibuprofen was turned down as not supported by facts. Cheminor Drugs, the pioneer in innovative processes for some drugs not granted products patents but only process patents was able to manufacture and export at much lower prices — also market them in India at a fraction of prices prevalent in USA, did not care to fight the dumping allegations but others did fight and win. Now the ultimate weapon of Super 301 has been used. The global demand for ibuprofen is said to be 4000-5000 tonnes and probably 1000 for similar formula drugs. India has a capacity of 2,500 tonnes much of it in the small scale sector. India's exporters quote against each other and prices fell sharply from $18 to $13 per kg.

No doubt with joint effort from the producers and exporters India can still continue the exports and not be cowed down by the big stick used by USA.

Price increase for petrochemicals ?

The slump in the price of most petrochemicals over the past one year accompanied by a minor recession may perhaps be over during this quarter and prices creep upwards from 3rd quarter of 1992 — as per expectations of the European/US producers. The projected price levels for some important items in the 2nd, 3rd and 4th quarters of 1992 is as given in table below.

Ethylene and polyethylene seems to suffer the most while there is tightness in methanol.

	Unit	Q1	Q2	Q3	Q4
Ethylene	Cents/lb	18.1	16.5	15.5	18.0
Benzene	Cents/gallon	108.0	125.0	135.0	120.0
Styrene	Cents/lb	23.7	24.5	25.0	24.0
Phenol	Cents/lb	28.0	30.0	31.0	30.0
MEG	Cents/lb	23.7	22.0	21.0	21.0
LDPE	Cents/lb	32.0	30.5	28.5	30.5
Polystyrene	Cents/lb	39.4	38.0	37.0	36.0
PVC	Cents/lb	25.3	27.3	27.3	26.0
Methanol	Cents/gallon	44.3	50.0	53.0	55.0

FRANKLY SPEAKING: by Dr. O.P. KHARBANDA, Cost & Management Consultant, Bombay
S.A. Sapre, Director, Institute for the Study of Work, Bombay.

How to motivate? It's harder than you think!

Herzberg's Motivation-Hygiene theory is undoubtedly one of the seminal contributions to the philosophy of management. In its simplest form, it postulates two sets of factors; MOTIVATORS (e.g., achievement, recognition, work itself, responsibility and advancement) which lead to improved performance; and DISSATISFIERS or hygiene factors (e.g. company policy, administration, working conditions, salary and job security) which do not lead to improved performance. They can only avoid unpleasantness. Further Herzberg has identified animals as having only one dimension of growth namely physiological. Man has, in addition, a potential for psychological growth taking place through his work. This is a great merit of Herzberg's theory. Herzberg's theory has served useful purpose, but seems to have failed to stand the test of time and realities in the workplace. Specifically it has four limitations. FIRSTLY, it is restricted to employees and is not applicable to self-employed persons. SECONDLY, it ignores the importance of work per se, e.g.

Buddha: Work enables a person overcome egocentredness,

Bhagvad-Gita: Perform your prescribed duty...A man cannot even maintain his physical body without work.

Voltaire: Work banishes the three great evils: boredom, vice and poverty.

THIRDLY, it does not cope with the social ills of alienation and anomy, which the Japanese have tackled effectively through lifetime employment and omiyari (i.e. concern for others)

FOURTHLY, it belittles the importance of money. Lack of money is seen by Herzberg as a DISSATISFIER, whereas in fact it is, perhaps, one of the most important MOTIVATORS, e.g.,

* Most of the strikes have their origin in wage disputes
* The fabulous salary and bonus of most of the American top executives motivates them to hard work and dedication.
* **Keynes:** There are valuable human activities which require the motive of money-making.
* **Shakespeare:**...this avarice (for money) sticks deeper

Herzberg is clearly mistaken in postulating that the DISSATISFIERS have no impact on psychological growth through work. It has been conclusively shown that the higher productivity of Japanese firms **even in America** is largely due to the meticulous attention paid to hygiene matters. The Japanese, for instance, aircondition the shopfloor first, whereas the Americans aircondition the offices first. Further, Herzberg's theroy does not take into account the **complex role of salary or money in** general. The relentless pressure for higher wages leads to a struggle for power between union and management. The longing for money **is probably the strongest of human passions.** Also it can both be creative as well as destructive. It can be a great inspirer, too, as it becomes a measure of recognition, achievement and responsbility. Numerous factors influence the attitude towards work, e.g.:

General Factors/Conditions:

* Our attitudes are decisively influenced by climatic conditions — as shown with great erudition by E. Huntington, a noted author
* Religious teaching, e.g., Protestant work ethic; Benedictine: To work is to pray

Organisational factors:

* Management attitudes, philosophy and practice
* Organisational structure and delegation of power
* The state of industrial relations
* Behaviour of the immediate superior
* Nature of technology and methods of training.

The attitude to work is among the most complex of all factors, such as those listed above. It can transform the person, impose certain ways of living, introduce him into a whole network of compelling human relationships, and release a whole range of human conditions, both positive and negative, constructive and destructive. Herzberg seems to have considered only some of these factors. The personality of a worker is shaped by these and many other factors, and work can ultimately transform his entire being. A comprehensive theory of work incorporating these and other relevant factors is yet to be formulated.

CHEMEXCIL exports touch Rs. 3520 cr.

Exports of Basic Chemicals, Pharmaceuticals & Cosmetics Export Promotion Council (CHEMEXCIL) for the year 1991-92 has registered an increase of 49 per cent to touch Rs. 3520 crores. It is also 4.4 per cent higher than the target fixed by the Commerce Ministry for the council.

There has also been a steady increase in exports to general currency area (GCA). Exports to general currency markets rose from Rs. 1456.9 crores in 1990-91 to Rs. 2406.7 crores in 1991-92, registering an increase of 65 per cent. "This substantial increase has been possible due to relentless efforts put by the council as well as the industry during the last one year," CHEMEXCIL chairman **Mr. Ramu Deora** said.

The increase in exports during the year was 49 per cent in rupee terms and 16.7 per cent in dollar terms over 1990-91. The council hopes to achieve Rs. 10,000 crores in 1994-95 and Rs. 20,000 crores by the turn of the century, Mr. Deora said. He said that the small scale sector contributed more than 60 per cent of the council's exports.

The spurt in exports to hard currency markets is mainly due to the measures announced by the new political leadership at the Centre, Mr. Deora said. Exports to rupee currency area will further reduce to 20 per cent and exports to GCA increase to 80 per cent during the new year, he added.

Exports of basic drugs and formulations which amounted to Rs. 784.8 crores during 1990-91 increased to Rs. 1281.1 crores during 1991-92, registering an increase of 63 per cent. As against exports of Rs. 506.8 crores of dyes and dye intermediates during 1990-91, the same sector contributed Rs. 836.1 crores this year, showing a 65 per cent increase. Describing the financial crunch facing the export community, Mr. Deora appealed to the government to expedite payment of pending cases of cash assistance totalling Rs. 400 crores. This has been pending for over eight months and relates to exports effected before July 3, 1991. In case payment cannot be expedited, the Reserve Bank should be directed to grant loan to exporters who have already filed their claims with various offices of the JCCI & E and this loan should be interest-free until payments are released by JCCI & E, he suggested.

Bulk drug sector shows continuing growth

Meanwhile the Annual Report of the Department of Chemicals and Petrochemicals has put the value of exports of the drugs and pharmaceuticals sector during 1991-92 at Rs. 1143 crores as against Rs. 951 crores in the previous year, thereby registering a rise of over 20 per cent.

The exports of Rs. 951 crores during 1990-91 was more than 11.5 per cent of the level achieved during 1989-90. A significant feature of the exports of pharmaceutical products is that the basic drugs were mainly exported to developed countries. The report says that production of drugs and pharmaceuticals as well as the range of production continued to show an upward trend.

This year's production of bulk drugs, estimated at Rs. 790 crores and formulations at Rs. 4,200 crores, shows a growth rate of 8.21 per cent and 9.89 per cent, respectively, over the previous year's production of Rs. 730 crores and Rs. 3,840 crores, respectively. The increased production of drugs has facilitated the aim of ensuring the national goal of abundant and easy availability of life saving and essential drugs at reasonable prices for the common man.

With a view to encouraging indigenous production at competitive costs during the year 1991-92, the process of rationalisation of duties was continued. Custom duty on 61 bulk drugs used for essential and life saving formulations was reduced to zero. Customs duty on 41 drug intermediates used for the production of 32 bulk drugs was also reduced. The report says that the trend of growth in consumption of plastics, synthetic rubbers and synthetic fibres makes it necessary to set up fresh capacity in basic petrochemicals during the Eighth Plan.

In the organic chemicals group production of methanol during 1991-92 is likely to be 1,92,700 mt. as against 32,700 mt last year. Production of acetic acid was 77,400 mt in 1990-91 and is expected to rise to 90,000 mt. in 1991-92. In the inorganic chemicals industry soda ash production is likely to touch 14.04 lakh tonnes in the current year as against 14 lakh tonnes in 1990-91.

The estimated production of caustic soda during 1991-92 is 10.23 lakh tonnes as against 9.99 lakh tonnes in 1990-91. The production of carbon black, an important input for the tyre industry, is estimated to rise to 1.25 lakh tonnes in the current year from 1.20 lakh tonnes in 1990-91 and of potassium chlorate to 8,600 tonnes from 8,300 tonnes in 1990-91.

HINDUSTAN AGRO CHEMICALS FARES WELL

Hindustan Agro Chemicals has fared well during the year under the review as profit before depreciation has gone up to Rs. 1.90 crore in 1991-92 as against 96.28 lakh in the previous year. After providing Rs. 68.17 lakh (Rs. 55.17 lakh) for depreciation, net profit of the company shot up to Rs. 1.22 crore as against Rs. 41.11 lakh in the previous year. The directors of the company propose to double solvent extraction capacity to 400 tonnes per day from 200-tonnes per day and chlorosulphonic acid plant capacity to 10,000 tonnes per annum from 5,000 tpa.

Punjab Alkalies registers highest profit, sales

Punjab Alkalies and Chemicals Ltd. (PACL) has recorded the highest-ever profit, sales and production during 1991-92.

Net profit at Rs. 10.28 crore was up by 66 per cent over Rs. 6.19 crore of 1990-91. Cash accruals at Rs. 14.56 crore recorded an improvement of 42 per cent over the last year's Rs. 10.22 crore. Sales at Rs. 49.89 crore were higher by 24.8 per cent over the previous year's Rs. 39.97 crore. Production of 42,896 mts of caustic soda marked an increase of 11 per cent over that of 1990-91.

PACL, which had paid 18 per cent dividend last year, has recommended 25 per cent for 1991-92. PACL Managing Director, **Mr. A.K. Dubey** said that future prospects of the company were bright. The company was currently executing a Rs. 13-crore capacity opitimisation project which shall be completed by August.

Capacity of the company's caustic soda flaking unit was being raised from 50 tpd to 80 tpd at a cost of Rs. 4.5 crore. Major expansion was being undertaken by installing a100 tpd membrane cell caustic soda plant. Works were underway on industrial alcohol distillery and ethylene dichloride project. Hydrogen peroxide was another project in hand. Approximate total cost of the new projects was Rs. 200 crore. The company proposes to announce soon steps to tap the capital market for its expansion and diversification.

Set up at a cost of Rs. 31.25 crore in 1984, the company's gross block today stood at Rs. 52.91 crore. PSIDC, Markfed and Mutual Funds were its major shareholders, while the remaining equity was held by more than 28,000 shareholders, both in India and abroad, with the largest block coming from rural areas of Punjab. Set up at Naya Nangal, the PACL plant enjoyed proximity to power from the Bhakra Dam project. As a result, the quality of power was good and its availability, by and large, consistent.

Though the company was registered in 1975, the project remained more or less on paper till early eighties. Work was, however, intensified after PSIDC started implementing the project in right earnest and the hunt for appropriate technology suitable, process knowhow and equipment started. PACL ultimately settled for the then state-of-the-art technology offered by Uhde GmbH of Germany. Its Indian subsidiary Uhde India supplied the design and detailed engineering.

Mr. Dubey said the operational results for the year ended March, 1992 had surpassed all previous records. The year set a new milestone with net profit of Rs. 10.28 crore, recording an increase of 66 per cent over that of last year. The first phase of the Rs. 13 crore capacity optimisation project by the addition of balancing equipment completed already had helped increase the production to an all-time high of 42,896 mt. recording an increase of 11 per cent over that of the previous year. Sales turnover at Rs. 49 crore had gone up by 24.5 per cent. With the second phase of the capacity optimisation project, likely to be commissioned by August-end, production would go up by another 15 per cent.

Ethylene dichloride

Mr. Dubey said PACL proposed to enter the field of alcohol-based chemicals, particularly those using chlorine as a raw material. Accordingly ethylene di-chloride project marked a major diversification. The company had secured a LoI from the government for establishing a 33,000 tpa ethylene dichloride EDC project.

Soap manufacturers allege cartel in caustic soda

With the expansion of sugar, textiles, glass, paper, soap and vanaspati industries and the setting up of new plants, the consumption of caustic soda flakes in the country has recorded substantial increase. But production lags behind demand. The demand-supply shortfall has, therefore, seen prices shooting up to Rs. 865 per 50 kg from Rs. 625 in October last reports the *National News Service*, from New Delhi.

It is believed that leading manufacturers of caustic soda have formed a cartel to push up prices. In view of the liberal industrial policy announced by the government, many new industries have been coming up in Rajasthan, Madhya Pradesh, Uttar Pradesh, Maharashtra etc. and the benefit of the ever increasing demand for caustic soda flakes will be shared by all manufacturers, present as well as future.

The Rajasthan Soap Manufacturers Association has alleged that between April 1990 and February 1992, leading caustic soda manufacturers enhanced prices at least six times, by forming a cartel, to Rs. 14,000 per tonne from Rs. 10,000 a tonne. It is pointed out that the price rise from 1986 to 1988 was only about Rs. 600 per tonne.

Some of the consuming industries express the view that till 1987-89, import of caustic soda was under OGL and indigenous manufacturers did not dare raise prices of their products. But as imports were placed under restricted list during 1988-89, manufacturers were induced to raise prices. During the peak consumption season, they even restricted supplies to push up prices further. During the new crop season, demand from consuming industries like sugar, textile etc. is generally higher.

According to trade circles, the number of caustic soda plants in the country is limited. During 1990-91, production of Gujarat Alkali (about 1.28 lakh tonnes), Grasim (1.11 lakh tonnes) and Standard Alkalies (61,000 tonnes) accounted for 30 per cent production.

Apart from the above manufacturers, Sri Ram at Kotah, DCM (Delhi), Modi (Alwar), and Thapars (Yamunanagar) have also entered the production of caustic soda flakes.

Total production was estimated at 10.1 lakh tonnes while during 1980-81, it recorded 5.70 lakh tonnes showing an increase of 4.40 lakh tonnes during the past 10 years against 8 to 10 per cent rise in demand per annum.

CHEMFAB ALKALIS INVESTING IN MALAYSIA

The Pondicherry-based Chemfab Alkalis Ltd., is all set to make an investment in Malaysia. On the anvil is a caustic soda plant which follows an agreement with Malaysian government to that effect. This, however, is only one of the various diversification propositions the company has put forth recently at its AGM.

A project for manufacturing sorbitol powder using dextrose as the starting material is also underway. This one is to be given an export orientation. At Madras, it is to convert its desalination efforts into a plant equipped to produce one million gallons of pure potable water per day.

The project will have the company's contribution to its equity capital. Another success story has been the generation of hydrogen which the company, claims is the largest production of pure hydrogen in the country. The company has started supplying it to manufacturers of edible oils, pharmaceuticals and defence electronic products.

New Era group to make alcohol-derived chemicals

The New Era Technologies group is diversifying into agro-based chemicals for domestic and export markets. The chemicals venture, initially a Rs. 20-crore effort, contemplates production of 4,500 tonnes of oxalic acid, 1,500 tonnes of diethyl oxalate and 15,000 kilolitres of industrial alcohol annually. The chemicals facility will come up in the Cuddalore chemicals complex of Tamil Nadu on the fringe of Pondicherry. When it will have material for exports, it will have access to the Pondicherry port, about 20 kilometres away. Part of the oxalic acid and industrial alcohol will go into the making of diethyl oxalate. This intermediate is used for vinyl sulphone and sulphamethoxazole (SMX). The latter is a sulpha drug and the former is used in the production of dyes.

According to **Mr. Thiagaraj S. Chettiar,** Managing Director of New Era group, the important aspect of the proposed chemicals facility is that it will be completely insulated against foreign exchange uncertainties, both for its capital goods and raw materials. Seven Indian companies have proven capacity to fabricate and instal the needed machinery and equipment. New Era Agro Chemicals venture has sugar and molasses as raw materials. These are freely available in the South. Again industrial alcohol has been taken out of the licence list and the Central levy. Similarly molasses have been made free both for movement and trading.

The chemicals the company is planning to manufacture have a growing market. They are used as metal cleaning compounds, polishing of flooring, textile processing, production of antibiotics and as intermedites for other chemicals. With diversification, barring the latest chemicals, the group's asset base has increased by 30 per cent to Rs. 75 crores and will touch Rs. 100 crores by mid-90s with the commissioning of the chemicals plant.

WESTERN INDIA SUGAR PLANS FOR ETHYL BENZENE PRODUCTION

Western India Sugar & Chemical Industries Ltd., which is setting up a Rs. 47 crores sugar cane crushing unit at Kalahandi in Orissa with an installed capacity of 2500 TCD is, in a later date, planning for production of ethyl benzene from captively produced alcohol. The company is jointly promoted by the Western India Industries Ltd. Western Paques (India) Ltd., and the Industrial Promotion & Investment Corporation of Orissa Ltd. (IPICOL). According to the Vice Chairman of the new company, **Mr. Nangan Gadgil,** who is a Dubai-based NRI, setting up of a sugar crushing unit is only first part of the integrated project planned in three phases. In the second phase the company proposes to increase the crushing capacity from 2500 TCD to 3500 TCD after the commencement of commercial production. The company also proposes to set up an industrial alcohol manufacturing facility and then double the cane crushing capacity to 5000 TCD. Unlike, other industrial alcohol manufacturing units, the company proposes to convert alcohol to ethyl benzene which is required for styrene manufacture. In the third phase the company plans to add an appropriate power intensive unit to make optimum use of the surplus power generated by setting up a smelting unit. Mineral for the smelting unit will not pose a problem as Orissa is rich in several minerals.

DR. REENA RAMACHANDRAN IS HOC's NEW MARKETING DIRECTOR

Dr. Reena Ramachandran has taken over as Director (Marketing) in the Government owned company Hindustan Organic Chemicals Ltd.

A M.Sc (Chemistry) and Ph.D (Chemistry) from Allahabad University and Doctorate in Chemistry from

Dr. Reena Ramachandran

France, Dr. Reena Ramachandran is recipient of various prestigeous awards and honours at the national and international levels. The Vice-President of India has conferred on her "Mahila Shiromani" Award —1989 for Excellence in Management.

Prior to joining HOC, she held key positions in Department of Science and Technology, Cement Research Institute, Oil & Natural Gas Commission (ONGC) and the latest being as Executive Director, Petroleum Conservation Research Association. Spanning the period over 27 years, Dr. Reena Ramachandran has rich experience in scientific areas, specialisation being in corporate management and marketing operations. She represents a number of Board/Advisory Councils of Government and Non-Government Institutions.

To her credit are more than 100 publications/papers in the areas of Energy Management, Corporate Management, Transfer of Technology, Industrial Discipline, Applied Chemistry, Productivity, Corporate Communication, Oil and Gas, Mini Cement Plants, Women in Management and Public Sector.

Rinki Petro's formaldehyde unit by September

Rinki Petrochemicals & Industries Ltd. (RPIL) has plans to manufacture about one lakh tonnes per annum (tpa) of methanol and downstream products, says **Mr. S.K. Gandhi,** Managing Director of the Rinki Group.

Speaking to newspersons, in Baroda on May 2, Mr. Gandhi said the company has entered into technical collaboration and equity participation with Lurgi AG of Germany. The collaborator will bring in four million DM and will have 4 per cent stake in the company.

The project estimated at Rs. 180 crore will commence production subject to the availability of gas. According to Mr. Gandhi, the project "which will be given top priority" will take a year or two to get the requisite gas allotment. The company has received a line of credit for foreign capital from BHF bank of Germany, he added. RPIL has also entered into a 50 per cent buy-back arrangement with the collaborator for methanol.

The company also plans to enter the capital market with public issue, the modalities for which are yet to be chalked out. However, the public issue will be anywhere between Rs. 50 to Rs. 100 crores. In the meantime, the company is going ahead with the second phase — the downstream products of methanol viz. formaldehyde and resins. It has already started erection of equipment and is expected to complete the construction work by September this year. For the downstream products the company plans to buy 15,000 tonnes of methanol from the local market, Mr. Gandhi said.

Rinki Industrial Oils to triple capacity

Rinki Industrial Oil Ltd. (RIOL), a flagship company of the group has plans to triple its production capacity of motorol, the brand name for its wide range of industrial and speciality oils such as aluminium oil, ink oil and white oil, to 10,000 kilo litres per annum. The project also includes a plan to establish a R&D facility at a cost of Rs. 35 lakhs.

To part-finance this project the company will offer 28,35,000 shares of Rs. 10 each for cash at a premium of Rs. 3.50 per share. The issue will open on May 20. Presently the company's motorol-engine oil with a market share of more than three per cent is catering to the replacement market, says Mr. Rinki Gandhi, Executive Director. To attract consumers who need small quantity of multi-grade oil the company has come out with small packs. RIOL's plastic division at Halol, Gujarat for plastic films will also double its production by the year end to 1,600 tonnes per annum and will be the biggest plant in the country. It also manufacturers blow moulded plastic containers.

SPIC signs pact with BCIL for bio-processes

Southern Petrochemical Industries Corporation Limited (SPIC), a widely diversified Rs. 1,000 crore business conglomerate, has signed an agreement with Biotech Consortium India Limited (BCIL), Delhi for promotion of bio-processes developed by SPIC for effluent treatment plants. The agreement was signed by **Mr. P.R. Sundaravadivelu,** Executive Vice President, SPIC and **Dr. S. Chandrasekhar,** Managing Director, BCIL in Madras recently, according to a SPIC release.

The BCIL promoted by a consortium of all India financial institutions including the IDBI, IFCI, ICICI, UTI and RCTC in coordination with the Department of Bio Technology, Government of India, would market biotechnology processes and products for prospective users in terms of technical transfer, financial assistance, institutional linkages, information services, technology status and market potential studies. SPIC has developed bio-process technologies for treatment of a variety of effluents. These processes are currently being employed in a number of chemical units being run by the group.

These include: urea biohydroylysis-UBH (employed in SPIC's fertiliser complex at Tuticorin), glycol biotreatment (employed in Manali Petrochemical Ltd. Madras), Phenol biotreatment (refineries) and two plus one bio-methanation process (distilleries). With this agreement, the BCIL will disseminate the process technologies by co-ordinating with different government departments (for approvals), industry associations, prospective users and technical experts by arranging meetings, seminars and workshops. It will also provide technical expertise, information services and arrange for funds and other facilities wherever required for expeditious dissemination of the technologies. SPIC, on its part, will provide basic engineering package and other detailed engineering services including procurement, planning, quality assurance, erection and commissioning for any project arranged through BCIL, besides providing requisite performance guarantees wherever required.

KGMA SEEKS REVIEW OF KEB DECISION ON OXYGEN UNITS

The Karnataka Gas Manufacturers' Association (KGMA) has sought a review of Karnataka Electricity Board's (KEB) decision to impose 25% demand and energy cut on oxygen manufacturing units in the state from April. Speaking to the reporters at Bangalore recently, the association president, **Mr. K. Gururaj** said 'the severe power cut has come as shock, as it an essential service industry''. With the reduced power supply, health and defence services would be hit, he said. ''Since oxygen is a continuous process industry, it needs uninterrupted power supply'', he added. Earlier the power cut was 10 per cent. The KGMA which was founded last year has Bhoruka Gases Ltd., Asiatic Industrial Gases Ltd., OIL, Southern Gases Ltd., Asiatic Oxygen Ltd., Kap Steel Ltd., United Oxygen Company Ltd., and Vijaya Oxygen Ltd., as its members.

CRL-HLL TIE-UP FOR LAB?

The state-owned Cochin Refineries Ltd. (CRL) has evinced an interest in setting up the linear alkyl benzene (LAB) project with Hindustan Lever Ltd. (HLL), according to company Chairman **Mr. S.M. Datta.**

Mr. Datta, who was addressing the shareholders at the 59th annual general meeting of HLL at Bombay recently said that Cochin Refineries had sought details from the company regarding the investment it was prepared to make. '' Negotiations are on for the project'', he added.

CCEA clears GE, IPCL collaboration

The Cabinet Committee on Economic Affairs (CCEA) has cleared the long pending Rs. 125 crore collaboration between the U.S. multinational, General Electric Inc. (GE) and the public sector Indian Petrochemicals Corporation Ltd. (IPCL) to make high-grade engineering plastics in the country.

The CCEA also approved a Rs. 340 crore ethylene expansion programme for IPCL at Nagothane, which will take the project's capacity up to four lakh tonnes of ethylene with an additional one lakh tonne of high density polyethylene (HDPE). The ambitious GE collaboration (dubbed GE Plastics) is ultimately expected to involve an investment of Rs. 700 crore in phases, when all expansion plans are put into effect.

GE Plastics will manufacture 15,000 tonnes of plastic alloys and blended compounds which are used in hi-tech applications for computers, automobiles, electronic items and in safety applications. The plastics would replace metals, wood and glass in these industries. The IPCL-GE joint venture envisages an equity participation of 50% each, with a total subscribed capital of Rs. 50 crore.

The venture was among the first such 'new model' collaborations that the Indian government had thought of in the public sector. A joint venture agreement was signed in early 1991, before the new liberalisation policy was announced. The Secretary to the Department of Chemicals and Petrochemicals, **Mr. M.S. Gill** played a key role in getting the GE Chairman, Mr. **Jack Weltch,** interested in the project. Mr. Weltch subsequently visited India for a survey. In a major concession, GE has vacated the Middle East territory for engineering plastics to GE Plastics so that it can earn back its foreign exchange expenditure. Financing for IPCL's expansion of ethylene capacity to the minimum economic size (MES) of four lakh tonnes has already been tied up with the World Bank, which is extending a loan of Rs. 233 crore.

IPCL is on the verge of a major expansion programme following the recent Cabinet approval for the Rs. 3,500 crore Gandhar petrochemical complex. The complex will have seven downstream units — a 1.5 lakh tonnes per annum (TPA) PVC unit, a 1.2 lakh TPA ethylene oxide and glycol unit, and alpha olefins, primary alcohol and alcohol ethyloxylate units with capacity of one lakh TPA each, a caustic soda and chlorine project with capacity of 1.5 lakh TPA and an 80 mw captive power unit.

The project will not depend on budgetary support and additional resources will be generated through public borrowings. Mobilising the foreign exchange component of Rs. 700 crore is not expected to be a problem, and will be tied up with foreign multilateral financing corporations.

MARUTI PLASTICS TO EXPAND WOVEN SACKS CAPACITY

Maruti Plastics Ltd., manufacturers of woven sacks have drawn up a Rs. 13-crore expansion and diversification scheme to meet the growing internal and export demand. Established in the SSI sector in 1986, the unit has been a consistent profit-making concern even in difficult days for woven sacks.

According to **Mr. Vijay Gar,** Managing Director, many of HDPE woven sack units have come out of the red thanks to the boom in the cement market. The fact that almost all cement units are going in for expansion in capacities and the recent demand for the sacks abroad, is bound to keep the industry in the forefront once again during the nineties.

Du Pont to make polyester film in $120 million EOU

Du Pont of the United States and RPG Industries have announced the creation of a 100 per cent export-oriented joint venture christened Du Pont RPG Ltd., to manufacture and develop polyester base film for photographic, electrical, medical, packaging and other applications.

This is the first time the $40 billion American corporation is using India as a production base for its global markets. The project investment is estimated to exceed $120 million. **Mr. Sam Singh,** Delhi-based president of Du Pont Far East Inc. told *The Economic Times* that this will be Du Pont's fourth plant to manufacture the material and will be a world capacity plant. Du Pont has two plants manufacturing "Cronar" range of polyester films: one in the US and one in Luxembourg in Europe. Du Pont will handle global export sales of the joint venture while the Indian market will be serviced by Du Pont RPG Ltd. Du Pont and RPG will have equal equity participation in the company and a "sizable portion of the equity will be made available to the public".

The manufacturing facility will be at the chemical zone of Maharashtra Industrial Development Corporation (MIDC) at Kurkumbh near Pune. The first of its kind in India, it will be modelled after existing Du Pont facilities overseas. Monoethylene glycol, one of the inputs, will be available, from SM Dyechem's glycols project coming up in Kurkumbh and the other raw material dimethyl terephthalate is also available from within the state.

"Polyester film is a product of the future for India and, with the explosive growth of the Indian economy, it has great potential", said **Mr. R.P. Goenka,** Chairman Emeritus of RPG Enterprises. The polyester project along with the Thapar Du Pont nylon project, involving an investment of over $300 million, represents the highest investment in India proposed by any foreign company ever since India went for liberalisation, Mr. Sam Singh said, Mr. Singh said the Thapar Du Pont project was going ahead and the company was awaiting two clarifications from the government. One is on the duty structure on inputs like adipic acid. The other clarification is regarding exports.

DACL PLANS MAJOR EXPANSION

Dhampur Alco-Chem Ltd., (DACL) is planning a major diversification into the field of expanded polyethylene sheet or expanded polyethylene foam (EPF) and cross linked plastics (CLP). The company will be acquiring the technology for this from Nandisa International Inc. of Canada. The project is scheduled to go on stream in February '93, at an estimated cost of Rs. 450 lakhs.

PVC manufacturers hit by low priced imports

The alleged large scale under-invoicing of Poly Vinyl Chloride (PVC) has caused panic among the local manufacturers of the resin as processors have bee-lined for the imported product rather than the indigenous one.

A total of about 70,000 tonnes has already hit the local market and imports of about 25,000 tonnes of resin are in the pipeline. On an average monthly imports of 22,000 tonnes of PVC were witnessed during the first quarter of this year. The import of this substantial amount of underinvoiced resin has set alarm bells ringing among the producers of PVC. Many have resorted to discount offers as processors have turned to the imported stuff.

To satisfy processors and to expedite lifting of huge stocks of PVC, manufacturers have extended discounts anywhere between Rs. 2,000 to Rs. 3,000 per tonne. Reliance Petrochemicals Ltd. (RPL), the largest producer of PVC having an installed capacity of one lakh tonnes per annum, has reduced the basic price of the polymer by Rs. 1,800 per tonne from Rs. 24,500 per tonne to Rs. 22,700 per tonne. Apart from this reduction, the company is also offering discounts anywhere between Rs. 1,000 to Rs. 1,500 per tonne to bulk consumers. Thus the market price of PVC manufactured by RPL, is lower by more than Rs. 2,000 per tonne. Sources point out that RPL reduced the basic price of PVC early February to discourage imports. Even with the discount offer the offtake of the resin has not picked up.

According to a producer of PVC, large quantities of imports were earlier attributed to budget apprehensions that the polymer may be shifted out of OGL to appendix III. This led to heavy bookings in December and January. However, with the duty reduction by 30 per cent ad-valorem or approximately Rs. 5,000 per tonne more orders were booked for PVC resin. Imports of PVC traditionally coming in from South Korea, Mexico and Brazil have now been given the go-by signal while the market is flooded with under-invoiced raw material from Romania. Sources claim that Romania has offered the resin at heavily subsidised rates viz. between $350 and $411 per tonne as against the normal price of $530.

'Oravita', a vessel carrying 1,500 tonnes of PVC had recently berthed at Kandla with c.i.f. price of Rs. 10,859 per tonne ($345). The landed cost of this PVC inclusive of CVD comes to about Rs. 23,000 per tonne against the domestic price of Rs. 34,000 per tonne. 'Floresty', yet another vessel is expected to bring the resin at c.i.f. price of Rs. 12,925 per tonne ($411). Thus the landed cost would be around Rs. 27,000 per tonne.

AIPMA SEEKS DUTY REDUCTION ON PLASTICS

The All India Plastics Manufacturers' Association has expressed regret that no import duty relief has been proposed on the bulk polymers viz. LDPE, HDPE, PP and polystyrene in the recent concessions announced by the Finance Minister on 30th April, 1992. With partial conversion of Rupee the landed cost of all the polymers have escalated by 25%, says a press release from the Association issued in Bombay on May 2, 1992.

Inspite of 20% import duty relief granted to PVC resin, the landed cost works out to be higher than indigenously produced PVC Resins, the Association claims In case of other polymers it is beyond the reach of the processors to import the materials. "In the prevailing circumstances the prices of indigenous raw materials are bound to go up in line with cost of imported materials," says **Mr. Kirit Mehta,** President AIPMA. The Industry is already reeling under severe strain and stress due to demand recession, inflation and no-growth situation.

"Unless atleast 20% import duty relief is granted the very survival of Small Scale Units is at stake", Mr. Mehta says, adding that, "the Government should take into immediate consideration the implication of no-growth situation and threat to the very existence of innumerable small and tiny processors."

The Association has however welcomed the abolition of excise duty on insulated thermoware and vacuum flasks as also reduction of custom duty on ethyl benzene used for production of polystyrene.

GUJARAT CHEMI TO SET UP INJECTION MOULDING UNIT

Gujarat Chemi Plasto Ltd. is entering the capital market shortly with a public issue of Rs. 270 lakh. The company is setting up a plant for injection moulded plastic products at Daman, an Union Territory, at an aggregate project cost of Rs. 590 lakh. The company has been promoted by **Mr. Ramnik Shah** and **Mr. Tapan Shah.**

The company is setting up a plant with an installed capacity of 1,500 tonnes per annum for manufacturing of injection moulded products like plastic crates, moulded furnitures, containers for chemical and food processing industry, barrels, and thermoware insulated products.

The process for the manufacture of these plastic items is the injection moulding process. The process which the company will incorporate to manufacture the moulded products will yield products which will be economical, repairable, adjustable, correctable, stress-free, and highly competitive.

MRPL studying options to raise forex

Mangalore Refinery and Petrochemicals Limited (MRPL), which is being promoted jointly by Hindustan Petroleum Corporation and four Aditya Birla Group companies, is examining two options for raising the bulk of the foreign exchange viz. $173 million, out of the $178 million required for the project.

While the Barclays Bank of UK, with guarantees provided by the US Exim Bank, has agreed to provide $5 million to help MRPL pay for the foreign knowhow fees to three foriegn licensors, it will be several months before the company is able to decide which of the two options is preferable for arranging the foreign exchange component of $173 million.

The first option is to secure a foreign exchange loan from the Industrial Development Bank of India (IDBI) and the second option is to approach directly overseas bankers for the same. While IDBI is believed to have indicated an ability to take care of the entire $173 million requirement, several foreign bankers such as Citibank, Hong Kong Bank, Deutsche Bank and J.P. Morgan, too have expressed their willingness to participate in the project.

A decision on this will be taken only after carefully examining different terms offered by different banks and financial institutions. MRPL, it is learnt, is not sure it would not be too much for IDBI to take upon itself the responsbility of arranging the entire foreign exchange loan. It is, therefore, also examining the offers made by the foreign banks.

Mr. M.K. Bagrodia, Director of MRPL, told *The Economic Times*, that the company was also exploring the possibility of securing suppliers' credit from the equipment suppliers. Since it was too early now to decide on the sources of supply of equipment, the issue of suppliers' credit too has not yet been resolved. Mr. Bagrodia, however, indicated that export-import banks of the US and Japan too had shown interest in providing necessary assistance in this regard.

While the technical knowhow for the Rs. 2,090-crore Mangalore Refinery will be secured mostly from American companies, Japanese and European firms are likely to dominate in the matter of equipment supply, it is learnt. For example Japanese firms are now believed to be ahead of the American firms and even some of the European firms, hitherto considered leaders in the manufacture and supply of high-pressure reactors. Two of the three licensors who will be providing the knowhow for the refinery project are Universal Products and Kinetics Technology of the US.

Global tenders soon for 3 grassroot refineries

The Union government will soon float global tenders to enable foreign companies to bid for participation in the proposed three grass-root refineries, each of six million tonnes capacity, says a report in *The Economic Times*.

Significantly, unlike earlier occasions, when the government stipulated terms for participation of foreign companies, this time they are likely to be given freedom to spell out their own terms for participation in the proposed refineries.

The rationale behind giving more freedom to foreign companies is simple: the government just does not have the necessary wherewithal to implement the projects estimated to cost at least Rs. 3,000 crores each. Technologically, India, it is felt, need not be dependent so much on foreign countries unless the proposed refineries opt for hydrocrackers. The hydrocrackers are required for achieving higher yields of middle distillates. This is important for India where the consumption growth of middle distillates like diesel and kerosene is very high. The choice of hydrocrackers, therefore, appears to be obvious.

Oil industry sources feel that foreign companies may have to be given some "extra incentives" for persuading them to come to India. This is because most of the foreign oil majors might not have additional crude backup. Their existing crude sources are believed to have already been tied up with different refineries they have installed in different parts of the world.

Oil industry sources are not sure if big names like Exxon, Shell, Caltex will be at all interested in the proposed refineries. Chevron and British Petroleum had shown interest in undertaking oil exploration activities in India some time ago, so they might show interest in the refinery projects also. How will companies like Elf/Total of France, Mobil and Amoco of USA will respond to the tenders is of course anybody's guess. The sources, therefore, pin a good deal of hope on not-so-big companies of Europe and America.

One of the proposed three refineries will be located in the west coast (Gujarat) and Hindustan Petroleum Corporation has been asked to prepare a feasibility report on it. Of the two others, one will be located in the central India (Madhya Pradesh) and implemented by Bharat Petroleum while the other in eastern India (Orissa) by Indian Oil Corporation.

The government's anxiety to set up new refineries is understandable. No additional refining capacity was created in the whole of the Seventh Plan. The country's total refining capacity now stands at 52 million tonnes (actual availability being 48 million tonnes because of 6.5 per cent fuel loss at the time of refining) against the estimated demand of 56.7 million tonnes (1991-92). The demand is projected to rise to 80 million tonnes by the end of the Eighth Plan and to 100 million tonnes by 2000 AD.

The expansion programmes of existing refineries will create an additional capacity of about eight million tonnes by 1994-95: Cochin and Koyali three million tonnes each, Bongaigaon one million tonnes, Madras 0.9 million tonnes and Digboi 0.15 million tonnes.

Mangalore Refinery and Petrochemicals Limited (MRPL) which is being implemented in the joint sector will have the capacity of three million tonnes and the Narimanam refinery project being implemented by Madras Refineries Limited 0.5 million tonnes. MRPL is expected to be ready for operation by 1995-96 while the Narimanam project which will be a distiller by and large, too is understood to be in an advanced stage of implementation. The crude available at Narimanam being light, no secondary processing will be required.

The Assam refinery of the capacity of three million tonnes is yet to be placed before the Cabinet Committee on Economic Affairs (CCEA) as the financing pattern has not been finalised while the Karnal refinery of the capacity of six million tonnes has just received clearance from the Public Investment Board (PIB).

MINISTRY BLAMED FOR MYOPIC POLICY ON BRPL

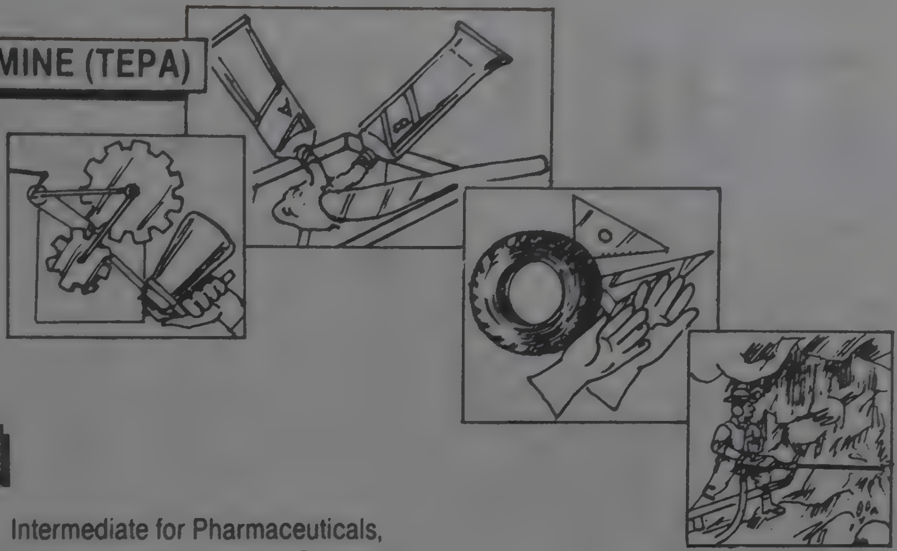
The Department of Scientific and Industrial Research (DSIR), under the Ministry of Science and Technology, has blamed the Petroleum Ministry for the latter's myopic policy on the downstream projects of the Bongaigaon Refinery and Petrochemicals Ltd. (BRPL), as a result of which BRPL's viability is threatened.

A draft report, 'Technology profile of foreign collaborations — state of Assam and Meghalaya,' which was submitted at an interaction meeting on absorption of imported technology under the aegis of the Confederation of Indian Industry (Eastern region) and DSIR, said: "Due to lack of adequate foresight, BRPL had made a wrong choice of downstream project from its xylene plant.

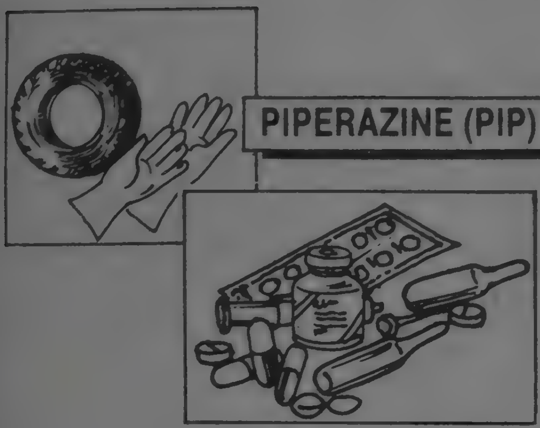
"Instead of going in for PTA (purified terephthalic acid), it had selected DMT (dimethyl terephthalate) as the downstream product which is ultimately being used for the manufacture of PSF (polyester staple fibre). PSF from PTA is not only technically advanced (quality-wise), it is also cost-efficient compared to PSF from DMT."

DSIR has also blamed the Centre for the collaboration agreements that contain "certain restrictive clauses which may prove to be deterrents in the realisation of optimum capacity utilisation of different plants".

TETRAETHYLENEPENTAMINE (TEPA)



Rubber and other Polymers, Mining and Metal Recovery, Coating and Adhesives, Fuel and Lube oil additives, Epoxy curing agent, Fabric softner.



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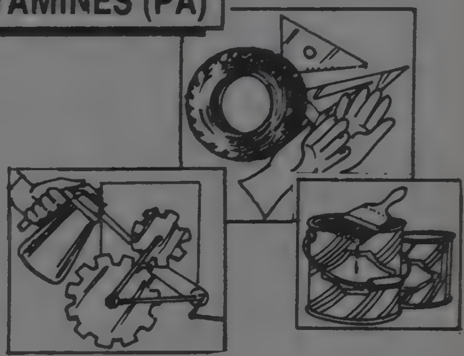
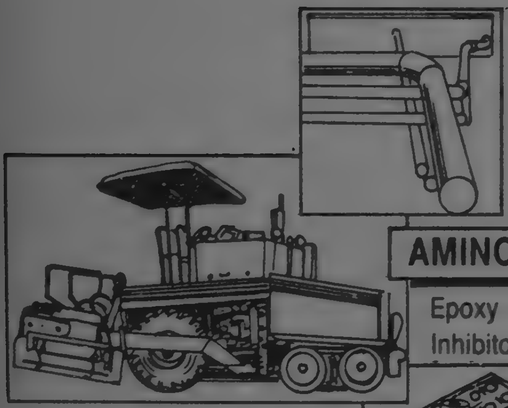


Rubber and other Polymers, Lubricating oil and fuel additives, Paints.



AMINOETHYL PIPERAZINE (AEP)

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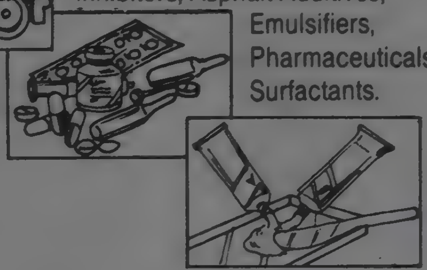

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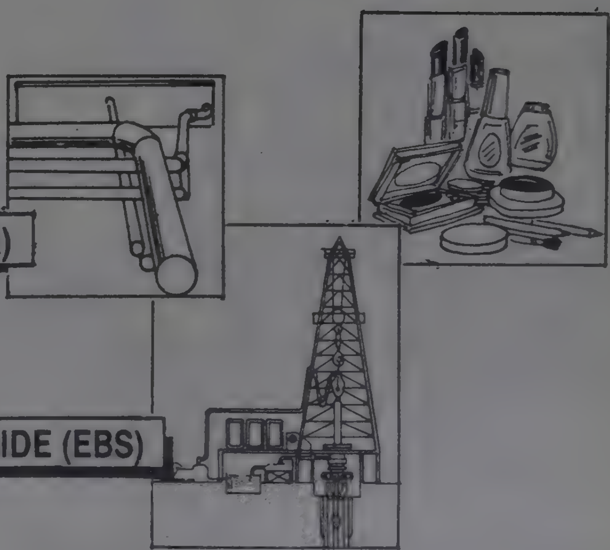

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Aromatics project to boost Tamil Nadu industrial scenario

The Center's clearance of Napco's multi-crore aromatics project has come at the right time when the state government was trying it's best to place Tamil Nadu back on the industrial map of India.

According to quick estimates the Rs. 1,725 crore aromatics project is capable of generating further investments of anywhere between Rs. 2,000 crore to Rs. 3,000 crore in downstream units. Though the direct employment potential is only 600, indirect job opportunities will be available to atleast one lakh people, it is gathered.

The aromatics project is for the manufacture of 200,000 tpa of purified terephathalic acid (PTA) (from about 150,000 tonnes of paraxylene), 30,000 tonnes of orthoxylene and 30,000 tonnes of benzene. At the time of this report neither the State Government nor Napco/MRL or SPIC has received the full details of the clearance by the Centre recently.

But it is learnt from reliable sources that once the letter reaches Napco, the two immediate tasks will be to identify the source of technology and to chalk-out funding programmes. Of the Rs. 1,725 crore cost, the Indian rupee component will be Rs. 1,159 crore and foreign exchange Rs. 566 crore. The debt equity ratio is likely to be one is to three. MRL and SPIC will each contribute 26 per cent equity and the balance 48 per cent will be tapped from public, private placement, bank loans, market borrowings, etc.

The foreign exchange component will be partly met by technological partners (yet to be chosen), suppliers credit, and commercial borrowings. Approaching the World Bank or ADB is also not ruled out, according to informed sources. The project will be implemented in 36 months time. The technology may be either from USA or Japan.

Atleast six standard size plants for polyester stable fibre (PSF) and polyester filament yarn (PFY), with capacities of 30,000 tpa and 15,000 tpa respectively, can be immediately put up using the two lakh tpa of PTA that will be made available by the aromatics unit. The PSF project cost is Rs. 200 crore each and that of PFY Rs. 300 crore each.

These two products in turn can help the handloom and powerloom industries, to produce blended fabrics which means lakhs of rural folks can hope to get gainful employment, informed sources say. Orthoxylene and benzene, can be deployed in several down-stream units for manufacturing a variety of projects, all of which at rough estimates can generate atleast Rs. 500 crore to Rs. 1,000 crore, it is said. The Madras Refineries Limited (MRL), which conceived the aromatics project received the LoI in February 1987 with capacities of 150,000 tpa of PTA, but subsequently the Centre revised the capacity to two lakh tonnes. The centre gave its first stage clearance in 1988 incurring an expenditure of Rs. 18 crore for evaluation and selection of technology, process package, basic engineering, cost estimates and other pre-project activities leading to the preparation of a detailed feasibility report.

The SPIC and MRL entered into an MoU in January 1989 to jointly implement the aromatics project and a new company National Aromatics and Petrochemicals Corporation (Napco) was floated in May 1989 to implement the project, with equity participation of 26% each. A revised techno-economic feasibility report prepared by the Toyo Engineering Corporation of Japan was submitted to the Centre in August 1989.

Prime Minister urged to clear Central India refinery

The Madhya Pradesh chief minister **Mr. Sunderlal Patwa** has requested the Prime Minister to expedite clearance of an oil refinery proposed to be set up in private sector with a view to boosting up the State's agro-industrial development. The Planning Commission had proposed setting up of an oil refinery, at a cost of Rs. 2,700 crore, in the State during the Eighth or Ninth Five Year Plan but had expressed its inability to allocate funds from the Petroleum Ministry due to its limited resources.

When pressed by the State Government for early setting up of the plant, the Planning Commission allowed the government to explore the possibility for setting up the refinery in the private sector. In order to expedite clearance for private sector proposals for the refinery, Mr. Patwa, in a letter to the Prime Minister, also requested him to form an inter-ministerial task force of the concerned Central Ministries for examining the potential and economic viability of the private sector organisations for setting up such a refinery in the State, official sources said.

The Prime Minister's Office (PMO) had informed Mr. Patwa sometime back that its proposals for such a task force was under the consideration of the Centre and the Planning Commission, the sources added. The proposed refinery, when commissioned, would save Rs. 40 crore of the State exchequer, which was spent in getting the required diesel and kerosene transported from Bombay and Baroda, the sources said.

The Bharat Petroleum Corporation Ltd. (BPCL) had done a survey in 1989 and approved the State as an ideal location for setting up a refinery in Central India from the economic point of view and for expeditious distribution of the petroleum products. The commissioning of the refinery would also ease the problem of getting railway wagons which had become another crucial factor for transportation of petroleum products to various parts of the country, they said.

A total of 13 oil refineries are at present functioning in different parts of the country and the Planning Commission had approved in the Seventh Plan the establishment of three oil refineries, one each in Karnataka (Mangalore), Assam and Haryana (Karnal) and recommended three more, one each in Central India, Gujarat and Orissa during the Eighth and Ninth Five Year Plans, the sources said.

IOC PLANS CRUDE OIL PIPELINE TO BARAUNI

The Indian Oil Corporation (IOC) has submitted a proposal to the Petroleum Ministry for setting up a new crude oil pipeline from Haldia to Barauni. The IOC proposal signifies that the government has dropped the idea of converting the existing product pipeline from Haldia to Barauni into a crude pipeline.

The new pipeline is expected to cost about Rs. 450 crore inclusive of a foreign exchange component of Rs. 65 crore. One of the biggest in the country, the pipeline is estimated to be around 560 km long. The pipeline is scheduled to be constructed within 48 months from the date of government's approval. A detailed feasibility report for government's clearance (stage II) is being prepared. The pipeline will help transport adequate crude oil to fully utilise the available refining capacity at Barauni which will ultimately help in meeting demand for the Eastern region.

The problem of shortfall in crude supplies to Barauni refinery arose when government approved expansion of the refinery from 3.3 million tonnes per annum to 4.2 million tonnes. Following indications form Oil India Limited (OIL) and Oil and Natural Gas Commission (ONGC), a project proposal was approved by the IOC board for augmentation of facilities with a view to absorb the projected increase of Assam crude availability vis-a-vis utilisation of 4.2 million tonnes of crude at Barauni refinery.

OIL, however, indicated that the capacity of crude oil pipeline (Bongaigaon-Barauni section) for supplying crude to Barauni is 3.3 million tonnes per annum which can at best be increased to 3.8 million tonnes. In view of these limitations in the Assam crude pumping capacity, the Assam crude processing capacity that can at most be attained at Barauni refinery with the completion of the facilities could be 3.8 million tonnes even though the available refining capacity is 4.2 million tonnes. However, due to lower production of Assam crude following agitations in the state the government was forced to abandon the project.

300-ACRE LEATHER ESTATE PLANNED IN MAHARASHTRA

The Maharashtra Government has earmarked 300 acres of land developed and administered by Maharashtra Industrial Development Corporation (MIDC) exclusively for the leather industry, according to the State Industries Minister, **Mr. Vilasrao Deshmukh.**

The area will house units for tanning, finishing and manufacture of footwear, leather garments and other value-added goods as well as accessories, components and consumables. Another feature will be a modern effluent treatment plant and common facilities like jobbing units, raw materials bank, design shops and training institutes for craftsman. Responding to the Ministers' gesture, **Mr. Prakash Mahtani,** president of Small-Scale Leather Industries Federation of Maharashtra promised his association's help to fulfill the Minister's scheme which will generate employment and foreign exchange.

Natural Rubber demand to go up 85% by 2000 AD

India will consume 700,000 tonnes of natural rubber by 2000, up 85 per cent from current levels, **Mr. J. Lalithambika,** Chairman of the Indian Rubber Board said recently. The country may have to import as much as 100,000 tonnes per year if local production fails to keep pace, she added.

Indian rubber production has grown by an average rate of 11 per cent per year over the past 4 decades, Lalithambika said. But demand from the nearly 6,000 local industries that use rubber has so far kept pace. In 1991, local production was 365,000 tonnes, and demand totalled 380,000 tonnes, Lalithambika said during a meeting of the association of natural rubber producing countries.

However, she said, she was concerned that presistent low rubber prices mean local farmers will produce a total of only around 600,000 tonnes by 2000. The government provides financial incentives to encourage farmers to grow rubber, but is not considering changes to its current restrictive policy on imports, she added.

The government's policy is to maintain a minimum 3 month stock of rubber. If stocks fall below this level, the State Trading Corporation (STC) is allowed to tender on the international market for imported rubber. India was a net importer of rubber until 1991 when the STC exported about 8,000 tonnes. Another 8,000 tonnes was exported in the past 2 months to Singapore, Lalithambika said.

These amounts were part of the 18,000 tonnes of stock the corporation built over the past two seasons as part of the government's price support program. The government has a current reference price of Rs. 22 per kilogram of RMA4, which the official said is comparable to RSS3. If local prices hit a floor below or a ceiling above that price, the government intervenes to buy or sell rubber. India is not a member of the International Natural Rubber Organisation (INRO), which groups consumers and producers, but supports producer calls for early renegotiation of the INRO agreement so that it is more effective in supporting prices, Lalithambika said. RMA4 and RMA 5 account for about 40 per cent of total production, while ungraded rubber accounts for another 40 per cent, the official added.

GLOOM IN GLOBAL RUBBER SCENARIO TO PERSIST

The gloom on the international natural rubber scenario is set to continue for some more time going by the signals emanating from world's major producing countries. For one, Indonesia, which kept itself away from the general trend elsewhere in the last couple of years, has also started feeling the pinch of the decline in prices and is facing a production cut.

Indonesia, the world's second largest producer of natural rubber, had in fact increased production of rubber to 1.27 million tonnes last year from 1.05 million tonnes in 1985. There has also been a rise in the area under rubber in that country.

One of the reasons being put forth for the present situation is the economic recession in the US, the largest consumer of natural rubber in the world. The low prices of the last couple of years are explained by an upward revision of production figures prior to that. In the case of Indonesia, the change in the approach of international tyre companies to buying rubber directly from the processors has contributed in large measure to the decline in prices.

The tyre companies were till recently buying the commodity from traders in Singapore. A more significant development is that small-holders in that country, who make up some 80 per cent of production and are paid about 70 per cent of the world market price for their rubber, are cutting back on the area of coverage.

Besides, high bank interest rates averaging 27 per cent have pushed up production costs by as much as 30 per cent in recent years. So much so, small farmers and processors have fallen by the wayside. Yet, there is optimism on an upturn in the fortunes of the natural rubber industry. According to experts, one of the positive developments is new production avenues and a pick-up in the demand of certain products. That more and more people are taking to production of gloves is a case in point.

The claims of synthetic replacements for natural rubber are also taking a beating with quite a few negative features being pointed out against the former. It is now said that natural rubber, with its assured qualities of strength and flexibility cannot be replaced by any synthetic polymer as an industrial raw material.

CPRI PILOT PLANT FOR LIQUID DIELECTRIC

The Central Power Research Institute (CPRI) Bangalore has set up a pilot plant for production of methyl ester for rapeseed oil (MRSO), a liquid dielectric used in capacitors.

The CPRI Director General **Mr. Ramamurthy,** told newmen recently that the Rs. 12 lakh pilot plant sponsored by the Centre for Technology Development was located at a private unit. He said the institute was also working on the cost-effectiveness in utilising MRSO as a replacement to transformer oil. Dr. Ramamurthy said the institute had developed a software package for optimal routing of distribution lines. This would help minimise the distribution losses, he added.

Wockhardt's plant gets FDA approval

Wockhardt, a Bombay-based pharaceutical company, has become the rst Indian firm to receive United States ood and Drug Administration (FDA) pproval for its plants manufacturing ulk drugs and formulations, reports *he Economic Times.*

Such an approval, granted after physical insepction of manufacturing facilities by US FDA officials, is mandatory before any company exports its products to the US. While several Indian companies have such approvals for bulk drugs, this is the first time an Indian company has received FDA certification for its tabletting plant, according to **Mr. H.F. Khorakiwala,** Wockhardt Chairman.

US FDA officials had inspected the company's manufacturing premises two years ago. Though many Indian companies have been seeking certification by American authorities in the recent past, US authorities have not come down for site inspection for the past 18 months. Some in the industry attribute this to pressure by the US Pharmaceutical Manufacturers Association (PMA), which has been lobbying against Indian industry on the question of inadquate protection of intellectual property rights. Wockhardt manufactures bulk drugs like dextropropoxyphene, pefloxacin, piroxicam and captopril and has about 35 per cent of the global market for dextropropoxyphene. The company's exports doubled to Rs. 10 crores this year, an impressive 10 per cent of this year's sales turnover exceeding Rs. 100 crores. Exports are expected to touch Rs. 32 crores next fiscal year and cross the Rs. 100 crore mark in three years.

As much as 95 per cent of the company's exports are destined to hard currency markets. Unlike many others in this industry, Wockhardt has been exporting to actual users and not traders and in the process built excellent customer rapport over the years. It has started exporting infant nutritional supplements like Dexolac to African countries and intravenous (IV) fluids to the Russian republic and neighbouring countries.

Wockhardt has set up a cell to promote overseas licensing, knowhow transfer and strategic alliances. It is setting up a turnkey project for Salam Pharmaceuticals in Syria, for which Wockhardt will get knowhow and royalty fees. The Indian company will set up the factory, train Syrian personnel and put the plant on stream. It will also be the central agency for sourcing raw material from India, according to **Mr. J.S. Khorakiwala,** Executive Director, Wockhardt is going public later this year.

ALEMBIC CHEMICAL TO LAUNCH NEW DRUG

Alembic Chemical Works Ltd., will launch soon for the first time in the Indian market the antibacterial Roxythromycin, under the brand name **Roxid.** Alembic is the first in India and the second in the world to manufacture Roxythromycin from the basic stage.

Having priced the product at Rs. 13 per tablet, the company expects to capture 50% of the domestic market. It is estimated that there would be a total demand of two tonnes of this drug during the very first year of its launch. In terms of value this would amount to Rs. 12 crore. Alembic manufactures over 100 world-class formulations and pharmaceutical specialities such as Althrocin (Erythromycin Estolate), Glycodin — an OTC cough syrup, Protinules — an oral protein supplement, Ciprowin (Ciprofloxacin), Norbid (Norfloxacin), Penicillin Injectibles and Sharkoferrol — a nutrient.

ACE LABORATORIES PLANS EXPANSION

Ace Laboratories Limited, a flagship company of the Ace Group, engaged in the production of speciality pharmaceuticals is planning a major expansion by increasing the existing capacities and adding some new products to its existing product range.

The project envisages a total cost outlay of Rs. 5 crore which will be financed through promoters equity of Rs. 160 lakh, a public issue of Rs. 240 lakh and loans from financial institutions/banks to the tune of Rs. 100 lakh. With the commissioning of the new plant at Bhiwadi, the company's turnover will touch around Rs. 1,200 lakh (approximately) in the first full year of operation and will give a net profit of around Rs. 115 lakh. The group is at present producing formulations used as antibiotics, anti pyretics, anti-tubercular, and anti inflammatory, as also enzymes, analgesics and tonics.

KARNATAKA MALLADI PROJECT BY APRIL 1993

Karnataka Malladi Biotics proposes to venture into the manufacture of cephalexin and 7-ADCA manufacture in technical collaboration with BIOPAL, Spain. Teaming up with it is the Karnataka State Industrial Investment and Development Corporation (KSIIDC). The company is setting up its plant at Madhya-a notified backward area with State subsidy, for production of cephalexin and 7-ADCA with a capacity of 100 tonnes and 90 tonnes per annum respectively.

It is earmarking 65 per cent of the production for exports. Necessary pollution control clearance has been obtained and the plant is expected to be commissioned by March 1993 and commercial production by the following month, April. The total cost of the project is estimated at Rs. 15.75 crores. The company proposes to raise Rs. 3 crores from the public by way of an equity issue. The equity of the promoters and associates is Rs. 3.95 crores.

Cepham to make drug intermediate in Punjab

The Cepham Group has promoted a Rs. 28 crore prestigious drug intermediate project, Punjab Antibiotics Ltd., in the joint sector at Derabassi in Punjab, in coordination with the Punjab State Industrial Development Corporation Ltd. (PSIDC).

The project is totally an import substitution one and will help save precious foreign exchange. The company, which is negotiating for foreign technical collaboration with a leading West European manufacturer, will have an installed capacity of 180 tonnes per annum of L-Base, a drug intermediate required in the manufacture of life saving drugs like chloramphenicol, chloramphenical sodium succinate and chloramphenicol palmitate.

These drugs are used in the treatment of diseases like typhoid, influenza, pneumonia, leprosy and meningitis. India is importing the drug intermediate and its derivatives at a foreign exchange outgo of around Rs. 200 crore per annum. When in production of L-Base, the company, will also export about 40 per cent of its production to the neighbouring West Asian and African countries. As a result, the company will be a net foreign exchange earner directly.

Further, plans have been made to manufacturer L-Base derivatives like chloramphenicol sodium succinate and chloramphenicol palmitate. The promoter group and associates will hold 25 per cent share, PSIDC 26 per cent and the public 49 per cent of the joint sector company. The estimated outlay of Rs. 28 crores will be funded through equity capital of Rs. 16.50 crore, term loan of Rs. 11.35 crore and state subsidy of Rs. 15 lakhs.

CORE PARENTERALS' SALES DOUBLE

The board of Core Parenterals Ltd., the largest manufacturer and exporter of IV fluids in India, has recommended a 1:1 bonus and 25 per cent dividend on pro rata basis for the year ended March 31, 1992. The company expects to maintain the dividend even on increased capital after the repeat bonus.

The company has once again almost doubled its sales and other income and profits, the same increasing from Rs. 13.29 crore to 1990-91 to Rs. 28.07 crore in 1991-92 and from Rs. 2.57 crore in 1990-91 to Rs. 4.27 crore in 1991-92 respectively. The company's EPS too has gone up from Rs. 22.32 per share in 1990-91 to Rs. 27.36 per share during the year, on a pro rata basis. The company has been consistently doubling its sales and profits and also increasing EPS right since inception for the last four years in succession.

It has achieved leadership in the field of IV fluids through manufacture of quality products. It employs the world's best FFS technology. In fact the company's products excel in terms of world standards and therefore there has been excellent acceptance of its products in various international markets. Core markets its products to various large, medium and small government and private hospitals and other customers throughout the country.

The company has been increasingly investing in export promotion and therefore expects to continue exporting a respectable portion of its sales on a continuous basis. During 1991-92, it maintained its export at 28 per cent of total production. The company's expansion project was commissioned successfully within the scheduled time and budgeted cost during the year and it is likely to boost the current year's performance.

Also, the company's issue of 80,50,000 — 14 per cent partly convertible debentures aggregating Rs. 16.15 crore received overwhelming respons and was oversubscribed 18.35 timed a far as the Indian public was concerned Part A of the debenture is expected to be converted into one share in Octobe 1992.

Core has now embarked on a major expansion-cum-diversification involving an investment of Rs. 321 crore, whereby it expects to expand its capacity of IV fluids five times such as to become one of the five largest manufacturers of IV fluids in the world. Thus, with implementation of this project, Core will become a company manufacturing and marketing a wide range of specialised high quality hospital products. The company is now negotiating with some internationally reputed companies for marketing of speciality products in India which can ultimately get converted into joint venture production facilities in India.

The company's investment of Rs. 321 crore will increase its turnover to about Rs. 400 crore. Implementation of this project has already started and the first two modules of production will be commissioned by December 1992. The company proposes to finance this project through internal accruals and a right-cum-public issue which is likely to be announced during the current year.

BOOTS PHARMA SHOWS HIGHER PROFITS

The gross profit of Boots Pharmaceuticals has gone up to Rs. 15.63 crore from Rs. 13.43 crore following the rise in sales to Rs. 104.60 crore from Rs. 85.94 crore in the previous year. Other incomes have increased to Rs. 3.85 crore from Rs. 2.58 crore. After making provision for depreciation of Rs. 2.13 crore (Rs. 1.70 crore) and taxation of Rs. 4.85 crore (Rs. 3.89 crore), the net profit has marginally come down to Rs. 5.93 crore from Rs. 6.01 crore. Out of this, the proposed dividend will absorb Rs. 2.75 crore (Rs. 2.59 crore) and a sum of Rs. 3.18 crore (Rs. 3.20 crore) has been credited to revenue reserves.

US removes chemicals, pharmaceuticals from GSP

The US President George Bush recently signed a proclamation stripping India of the privilege of exporting certain goods under the generalised scheme of preference (GSP). This followed the recommendation of US trade representative Ms. Carla Hills who said " Indian laws relating to GSP are still unreasonable under the special 301 US trade law."

A US trade official said that this is a "partial suspension" of GSP benefits to India — a benefit conferred by the US to encourage developing country exports. The partial suspension, the official said, "will apply principally to pharmaceuticals, chemicals and related products."

So far no duty was being paid on these goods, whose exports to the US from India were valued at $34 million last year. Now the importer will have to pay "probably around five per cent." Total US imports from India in 1991, the officials said, were about $3.2 billion.

President Bush, in his proclamation couched in highly technical terms as required under law, notes that the Trade Act of 1974 provides that the President may withdraw, suspend or limit the application of the duty-free treatment afforded under the generalised scheme of preferences with respect to any article or any country after considering the factors set forth in it.

India protests move

Meanwhile, India has lodged a strong protest against the Bush administration's action in suspending duty-free treatment on the exports of its pharmaceuticals and chemicals in retaliation for New Delhi's alleged failure to protect US intellectual property rights. Hardly had President George Bush issued the proclamation to this effect recently when Indian ambassador Abid Hussain called on US Trade Representative (USTR) Ms. Carla Hills to put on record his government's disappointment at the American trade sanction.

The action was "unjust and untimely" remarked Mr. Hussain, alluding to the otherwise improvement in Indo-US relations.

Earlier in the day, the USTR identified India — along with Thailand and Taiwan — under its trade law provision "Special 301" as a trading partner that denied market access and protection for US intellectual property rights such as patents, trade marks and copyrights.

The retaliatory action denied India duty-free import privileges available to the developing countries in the US under the generalised system of preferences (GSP).

The action was taken at the recommendation of an inter-agency task force set up by the USTR to suggest punitive steps against India after an year-long Special 301 investigation last February had determined that its "denial of adequate and effective patent protection is unreasonable."

Though the task force is reported to have favoured the extension of punitive sanctions to all of India's duty-free GSP exports which totalled $524 million last year, the administration restricted it to the country's pharmaceutical exports which are estimated at $60 million a year.

With the termination of the GSP, the Indian pharmaceutical exports will attract a five per cent duty — an annual loss of $3 million to Indian manufacturers. Talking to reporters, the USTR called the GSP suspension as a "rifle shot" absolutely focused on the items benefitting from failure to protect pharmaceutical patents. According to informed sources, the powerful pharmaceutical lobby and its supporters in the US Congress had compelled the Bush administration to proceed against India.

However, India's most favoured nation trade (MFN) status will remain intact under which its exports will be subject to tariffs that are usually less than five per cent.

Unfortunate move

Meanwhile, the FIEO president, **Mr. Kishor Shah** has expressed dismay at the US decision to suspend duty benefits to Indian exports of pharmaceuticals and chemicals under the provisions of Super 301. Calling the US move as most unfortunate, Mr. Shah held that such steps were against the concept of multilateralism in world trade. As a developing country, he explained that India's socio-economic needs and compulsions were entirely different from those of the United States, and appealed to the US to be realistic about the Indian situation.

More action likely

The Bush administration has threatened more retaliatory action against India if it fails to tighten up its relevant laws to prevent the piracy of US pharmaceutical patents, says a senior trade official.

In a special White House briefing arranged in Washington for a group of non-resident Indians, Ms. Nancy Adams, assistant deputy secretary, in the office of US Trade Representative (USTR), said that the suspension of duty-free treatment to India's exports of pharmaceuticals and chemicals was a only "a first minor step."

"Though minor, it is not an insignificant step," she said adding, "we wanted to send a strong signal to India about our seriousness on the protection of intellectual property rights."

Fertiliser production will hinge on natural gas allocation

The allocation of natural gas for the fertiliser sector holds the key for implementation of an ambitious plan to achieve additional capacity build up in the sector in the Eighth Plan, an official document says.

If the proposals of the capacity build up materialises, it would result in the indigenous capacity of nitrogenous fertilisers reaching a level of 113.2 lakh tonnes as compared to the present installed capacity of 82.5 lakh tonnes, the annual report of the Department of Fertilisers says.

Similarly, the capacity of phosphatic fertilisers is likely to go up to 37.7 lakh tonnes by the end of 1996-97, the terminal year of the Eighth Plan from the present level of 27.5 lakh tonnes, it says. "Much, however, would depend on allocation of natural gas for the fertiliser sector", it emphasises.

The working group on fertilisers, set up by the Planning Commission in the context of preparation of the Eighth Plan had recommended that the demand-supply gap of nitrogenous fertilisers be kept at the minimum and in any case not more than one million tonnes.

Recognising that the country did not have significant sources of rock phosphate and sulphur, the main raw materials for phosphates, it has recommended that the indigenous capabilities for the production of finished phosphatic fertilisers should be created to the extent of 85 per cent of the requirement.

The report anticipates that the gap between the demand and production would progressively increase from about 16 lakh tonnes in 1992-93 to 21.5 lakh tonnes in 1996-97 in the case of nitrogenous fertilisers and from 12.6 lakh tonnes to 26.7 lakh tonnes in the case of phosphates. This, it says, has been estimated by the Department of Agriculture taking into account the current operating levels of the existing plants and the additional production expected from the projects under implementation and plants for which gas allocation has already been made.

It emphasises bringing down the demand-supply gap by creating maximum possible additional production facilities in view of the global demand-supply situation and hardening of international prices both in the case of nitrogen and phosphates. The working group felt that the strategy for making additional fertilisers available during the Eighth Plan and beyond should be to augment indigenous production capacity by adopting such schemes which are not only cost and energy effective but also have shorter implementation period.

The plans for additional capacity build up includes proposals for the revamp of the fertiliser complex of the Madras Fertilisers Limited, replacement of the ammonia plant, and expansion of the fertiliser plants at Aonla and Vijaipur. Besides this, three plants on the Bombay High gas which were expected to be commissioned in the Seventh Plan are at various stages of implementation. They are located at Babrala and Shahjahanpur in Uttar Pradesh and at Gadepan in Kota district of Rajasthan. The report points out that the present feedstock policy for fertilisers envisages development of additional nitrogenous fertilisers capacity based mainly on gas. Gas will be accorded the first preference as feedstock and only when gas is not available, other feedstocks like naphtha would be considered while setting up new units, it adds.

1,234-CR. OUTLAY FOR FERTILISERS OKAYED

The Planning Commission has approved a plan outlay of Rs. 1,234 crores for 1992-93 for the department of fertilisers. Of the sum approved, Rs. 1,134 crores would be met out of internal and extra budgetary resources and the balance amount of Rs. 100 crores would be provided through budgetary support.

An outlay of Rs. 410.70 crores, with Rs. 32.70 crores to be met out of internal extra budgetary resources and the balance amount of Rs. 90 crores to be met through budgetary support, has been provided for the year 1991-92 and the expenditure is estimated at Rs. 379.39 crores. This information is contained in the annual report of the department of fertilisers of the Ministry of Chemicals and Fertilisers for the year 1991-92.

Fertiliser production

According to the report, the overall production of fertilisers, both nitrogenous and phosphatic, during the year 1991-92 is estimated at 9.85 million tonnes comprising 7.27 million tonnes of nitrogen and 2.58 million tonnes of phosphatic fertiliser registering an increase of about nine per cent in production over the last year.

Fertiliser production during the first 10 months of the year has been 82 lakh tonnes of nutrients, which is 9.2 per cent higher than the production achieved during the corresponding period of last year, the report said. The production of 60.05 lakh tonnes of nitrogen during the period was 3.6 per cent higher than the production level of 57.97 lakh tonnes achieved during the previous year.

The production of phosphatic fertiliser at 21.95 lakh tonnes up to January 1992 was 28 per cent higher than the previous year's production, the report said. The average capacity utilisation during 1991-92 is expected to be around 88 per cent in the case of nitrogen as against 85.8 per cent during 1990-91, and about 94 per cent in respect of phosphates as against 74.6 per cent in the previous year.

Resource crunch may limit petroleum imports

The Union Finance Ministry is reported to have rejected the Petroleum and Natural Gas Ministry's proposal to import 13,291 million tonnes of petroleum products and 26.96 million tonnes of crude worth about Rs. 16,800 crores during the current financial year.

According to official sources, the Ministry has indicated that it would be inclined to consider imports on the basis of a zero per cent growth for the petroleum products which are being imported. In contrast, the import plan submitted by the Petroleum Ministry for 1992-93 had envisaged a growth rate of 7.5 per cent. It had put the country's requirement of petroleum products and crude during the year at 61.5 million tonnes, against the actual consumption of about 57.2 million tonnes in 1992-92.

To add to the woes of the Ministry, the Government has also decided that henceforth, foreign exchange at the official rates of conversion will be provided for the import of only three items, crude oil, SKO and high speed diesel.

For the import of other petroleum products, even if canalised, foreign exchange will have to be arranged by the oil industry at the market rates. Such imports, therefore, would place extra burden on the industry because the market rate of exchange is higher than the official rate.

During 1990-91, the country had consumed 55 million tonnes of petroleum products. The consumption growth rate for 1991-92 over 1990-91 works out to about 3.33 per cent. During 1992-93, the Ministry had proposed to import 26.96 million tonnes of crude to make up for the shortfall in domestic production. This is about three million tonnes more than the figure of 24 million tonnes for 1991-92. Assuming a growth rate of 10%, it has suggested the import 4.210 million tonnes of SKO in 1992-93 against 3.317 million tonnes in the preceding year.

The proposed figure for high speed diesel is 7.760 million tonnes — the actual import of the commodity adding to 5.07 million tonnes in 1991-92. This is based on the assumption that the consumption of the commodity would increase by eight per cent during the year.

In the case of LPG, import of 0.45 million tonnes was proposed on the basis of port capacity. This means a growth rate of about 5.8% in the total consumption of the commodity. As for lubes and additives, the Ministry had proposed import of 0.398 million tonnes. The quantities suggested for imports in case of other products were: benzene 0.120 million tonne, RPC 0.140 million tonne, paraffin wax 0.060 million tonne and AV gasoline 0.003 million tonne.

CRUDE SUPPLY FROM RUSSIA ASSURED:

60,000 tonnes crude made available

Crude oil supplies to India from Russia have resumed after a break of almost a year and the first shipment of 60,000 tonnes of oil worth Rs. 24 crores is already on the way. The shipment is against the 1992 Trade Protocol, under which Russia is to supply four million tonnes of crude to India, the Commerce Secretary, **Mr. A.V. Ganesan,** said.

He told newsmen at New Delhi that during the recent discussions with the delegation of the Russian Federation, headed by **Mr. Gennady Burbulis,** India had expressed concern over the lack of progress in the supply of crude oil and petroleum products under the trade protocol signed in February this year. The protocol envisages supply of crude oil, kerosene and diesel worth $650 million.

During the deliberations, the Indian side said without the oil supplies taking place in a regular manner, it would be difficult to place the trade between the two countries on a viable footing. Mr. Ganesan said the Russian side gave a firm assurance that Russia would fulfill all obligations under the trade protocol and ensure supplies by its enterprises.

The Russian side also highlighted the incentives being formulated by it to encourage oil enterprises to export to India. These included a reduction in export tax, sale through the commodity exchange system and the financial benefits.

Mr. Ganesan said a delegation headed by the Russian Deputy Minister for Fuel and Energy and comprising managing directors of oil enterprises would visit India from May 18 to discuss the modalities of supply of crude oil to India. Mr. Ganesan said the oil enterprises were not exporting to India because the USSR bank had held up about Rs. 1,500 crores which was due to them for oil supplies last year.

He said while India had already paid Rs. 3,600 crores for the oil supplies, the USSR bank, instead of paying it to the suppliers, used it for other purposes. The Commerce Secretary said the delegation had assured India that Russia would stand by the protocol and fulfill the commitments whether it pertained to oil or defence spares supplies.

Mr. Ganesan said the shipment of oil which was started will be the first consignment being despatched in the past one year and its price will be based on international prices, he said.

7 OIL EXPLORATION PROJECTS APPROVED IN EIGHTH PLAN

The Petroleum Ministry has sanctioned seven major oil exploration projects for implementation during the Eighth Plan period to yield an additional 14 million tonnes of crude, the Minister of State for Petroleum, **Mr. S. Krishna Kumar** informed the Rajya Sabha on May 6.

Replying to supplementaries, the Minister said the government had opened up 72 offshore blocks for exploration by international firms. He said 31 bids had been received from these firms in respect of 13 oil wells and the contracts were expected to be finalised in a few months.

Sharing the members concern over the low output during the last few years, the Minister attributed it to rectification work undertaken in the existing oil wells, including Bombay High, to tone up production on a long-term basis. Mr. Krishna Kumar said the crude production target for 1992-93 was 28.5 million tonnes while the demand was expected to be 7.5 per cent more than that in the previous year. The shortfall last year was around three million tonnes. Referring to some members' apprenhensions over the supply of crude from Russia, the Ministry said a Russian delegation headed by the Secretary of State, **Mr. Gennady Burbulis,** which was in India recently had given an assurance on the commitment for supply of $650 million worth of crude in accordance with the 1992 trade protocol.

The delegation members told their Indian counterparts that Russia had offered incentives to its oil firms to step up exports to India. As regards supplies from other republics of the erstwhile Soviet Union, the Minister said Azerbaijan had indicated that it could not supply crude this year but had asked India to indicate its requirements next year.

Mr. Krishna Kumar said under the trade plan signed with Kazakhstan recently, the country had offered to supply India about one million tonnes of high-speed diesel this year. The contract was, however, yet to be signed. Negotiations with other republics on the supply of crude were in the preliminary stage, the Minister said. He said a small quantity of crude had been contracted for with China under the trade protocol signed last year.

Referring to criticism that the government had paid a higher price for crude imported from a Malaysian firm, the Minister said the firm had offered to supply 1.5 million tonnes on a credit basis for one year. The arrangement was useful, especially as the country had been faced with a severe foreign exchange crunch last year, he added.

FRENCH LINE OF CREDIT FOR ONGC

The Oil and Natural Gas Commission (ONGC) has signed an agreement with Credit Commercial De France (CCF) under which CCF will make available to ONGC a line of credit of FF 100 million (Rs. 55 crores approximately). According to ONGC, this line of credit will enable it to finance its imports and services of French origin.

Round-the-year bidding for oil hunt mooted

The government plans to switch over to round-the-year bidding for oil exploration from the recently completed fourth round bidding. The Ministry of Petroleum and Natural Gas is now considering a proposal, stressing on the need to have round-the-year bidding.

Once the Ministry vets this proposal, it will be sent to the Cabinet Committe Affairs (CCEA). Already, the proposal has gained substantial currency within the Ministry and oil companies. This was also indicated in a seminar held on the oil industry in the capital recently by the Minister of State for Oil, **Mr. S. Krishna Kumar.**

Though officials are not prepared to term the fourth round of bidding a failure, they do admit that the response was modest. Despite offering 72 blocks for exploration and commercial development, there were only 31 bids for 13 blocks, leaving 59 major blocks untouched. The moot issue at this juncture is one of moving expeditiously for the remaining 59 blocks on a round-the-year bidding as practised in countries such as Malaysia, says sources.

The new move for round-the-year bidding will underscore the need to provide the parameters and the data on the remaining 59 blocks to any domestic or foreign party willing to undertake the exploration of these blocks.

Also, sources say that since most of the international oil companies proceed on a detailed corporate plan on a yearly basis, they are not in a position to synchronise their investment outlays with exploration assignments in various parts of the world. Consequently, it will be beneficial to have round-the-year bidding so as to provide ample time to various international companies, sources added. Besides, there should be an attractive package of terms as regards production sharing and prospective returns in the round-the-year bidding, sources say. This is more so after the manner in which China, a country with vast offshore and onshore prospects, provided extremely liberal terms to the international oil companies. At present, 75 per cent of the country's sedimentary base remains unexplored while the rest is being explored by the domestic and foreign companies. The Oil and Natural Gas Commission and Oil India Limited could be allowed to enter into joint ventures for the exploration of medium sized fields, while the small fields should be privatised by leasing them out or outright sale, sources added.

One major lacuna in the present exploration effort is the inadequate data generation network. The sources say that there are foreign companies which are in a position to undertake both data collection and simultaneous production. The government may try and adopt this in the round-the-year bidding, process.

INCREASING CRUDE AVAILABILITY:

Higher production from existing reservoirs urged

Mr. S. Krishna Kumar, Minister of State for Petroleum and Natural Gas has called for a quantum jump in oil exploration and production activities in the country. He emphasised the importance of mobilising private sector capital and knowhow, in keeping with the Government's economic liberalisation policies, for improving the output and performance of this critical sector.

Inaugurating a round table discussion on hydrocarbons sector in India, he recommended that while a new strategy involving partnership between the private and public sectors was essential, several decisions could be taken immediately, whereby at least in the Eighth Plan period output could be enhanced rapidly.

For instance, the projects already identified including those at Neelam, Heera, Panna, Mukta, Ratna and others could yield upto 13 million tonnes of additional oil per year by the end of the Eighth Plan period, if these were implemented with urgency. With the decline in production from existing structures anticipated at about 3 million tonnes a year a net increase in output of 10 million tonnes a year can therefore, be achieved without major changes in the existing organisational arrangements, he said. The discussion was organised by the Tata Energy Research Institute (TERI).

High reserves to production ratio

Mr. Krishna Kumar also drew attention to the existing reserves to production ratio in India, which is roughly 21:1. This is much higher than the reserves to production ratio in other countries, and we can, therefore, need to implement measures by which production increases could take place without jeopardising ultimate recovery.

Mr. Krishna Kumar also suggested changes in the structure of the oil exploration and production organisations in India namely ONGC and OIL. It may be necessary to promote private sector participation in these two organisations and consider setting up smaller joint sector organisations to manage some of the oilfields which are marginal in the economic performance, he said.

Mr. Lovraj Kumar, a former secretary emphasised the importance of quick decisions for bringing about change in the manner in which operations in the petroleum and natural gas industry are currently carried out. He emphasised the urgency with which the government must now move, because some of the measures that need to be taken are well known and accepted in principle by the government, but there appears to be some reluctance to move ahead.

Dr. R.K. Pachauri, Director, Tata Energy Research Institute, put forward the view that India has to think and change its policies within a global context. Dramatic changes are taking place in policies for the hydrocarbon sector in several other developing countries such as Malaysia, Indonesia and even in Pakistan, where a much more liberal policy regime has been established to promote faster development of hydrocarbon resources. He also pointed to the lack of an energy policy in the country, which should provide the framework and define the parameters for an oil and natural gas strategy.

Natural gas imports

Mr. Pachauri pointed out to the possibility of natural gas imports from Iran by a pipeline which would involve commitments on the part of Iran, Pakistan and India. He felt that a serious dialogue should be initiated on the subject, irrespective of political problems that exists between India and Pakistan currently.

The round table was attended b selected experts, government officia and leaders of the hydrocarbons indu- try in India. Others who spoke include **Mr. P.K. Paul,** former Cabinet Secre- tary, Government of India, **Mr. S.I Khosla,** Chairman, Oil and Natural Ga Commission, **Mr. C. Ratnam,** Chai- man, Oil India Limited, **Mr. B.K Bakshi,** Director (Marketing), India Oil Corporation, **Mr. S.K. Manglil** member (technical), Oil and Natura Gas Commission, **Mr. Y.R. Mehta** Director (Planning), Gas Authority o India Ltd. and **Dr. E.A.S. Sarma,** Adv- sor (Energy Policy), Planning Commis- sion.

A summary of the discussions an recommendations will be submitted t the Government for early consideratio and action. All the participants fe strongly that unless the health of th hydrocarbons industry was improve the Indian economy would suffe adversely in the coming few years.

ONGC TO STEP UP DRILLING WORK

As part of its development plans, th Oil and Natural Gas Commissio (ONGC) would drill 2,533 well —1,101 exploratory and 1,432 deve- lopmental — in the country during th Eighth Plan. During this period, ONGC would undertake drilling work in area ranging from Gulf of Cambay and shal- low waters of Gandhar belt to sour Rewa basin in Madhya Pradesh, a ONGC spokesman told visiting journa- lists.

Foreign assistance would be sough for drilling operations in Saurashtra an Kutch, while in the Kutch offshor having a potential of 870 million tonne of oil and gas, ONGC would carry o operations on its own, the spokesma said. Results obtained from the six well drilled in Nada village of Broach di- trict had been encouraging, raisin hopes of an oil-rich area, similar to thos at Ankleshwar and Gandhar, th spokesman said.

Good opportunities for entrepreneurs in oil sector seen

The investment of Rs. 33,000 crore earmarked for oil, gas exploration and refining activity in the country during the Eighth Plan period will provide an excellent opportunity to Indian entrepreneurs to win a maximum chunk of this investment, according to **Mr. B.C. Bora,** Director (Operations), Oil India Ltd. (OIL).

Talking to newspersons in Calcutta on May 2, Mr. Bora said that the entrepreneurs could do it by upgrading their technologies and expertise with the help of technology transfer or joint venture arrangements. Besides this investment, nearly twice that amount would be allocated for other energy development activities, he said, adding that energy was the prime mover of the economy.

He said about Rs. 26,000 crore would be spent by the ONGC and OIL in the Eighth Plan up to 1996-97, for oil exploration and production. The services alone will account for an expenditure of about Rs. 9,000 crore, he said. These are, among other things, the services for chartering or hiring of drilling rigs, well logging, cementing, production testing and specialised offshore services such as diving and other operations according to Mr. Bora.

Despite two dozen Indian companies holding licenses for seismic survey and drilling, he regretted that only two or three companies were working in the seismic survey area and six drilling companies were as yet active. He said that "our entrepreneurs would do well to look in to the area of special seismic data processing and various well servicing operations, as the expertise they gain at home will stand them in good stead to tender for and get international contracts, particularly in West Asia and South East Asia".

Mr. Bora was happy to say that a few enterprising organisations had already made a foray into the global arena. He said among the public sector units BHEL had done well in exporting of equipment, Engineers India Limited was engaged in consultancy services in many countries overseas, and in the service area ONGC Videsh was exploring in Vietnam, by taking on a drilling contract.

The OIL Director observed "our entrepreneur-industrialists, once they satisfactorily break into the challenging oil scene by competing for and completing jobs for ONGC and OIL, can confidently take on the oil industry worldwide". Therefore, he laid stress on international standards in quality, which is mandatory in all petroleum operations, besides adhering to delivery schedules and prompt after-sales service.

Stating that we have forgotten the slogan of "export or perish" coined in early 80's he said "it was never truer and more appropriate then it is today". Speaking about the country's scenario, Mr. Bora said that the oil production in the country had stagnated from around 30 million tonnes to 34 million tonnes due to various reasons, while the gas production and consumption have gone up steadily.

With India's import bill on oil and petroleum products in the order of Rs. 13,000 crore to Rs. 15,000 crore, and a difficult balance of payment position, it was necessary to reduce this through a multi-disciplinary approach, according to Mr. Bora. He suggested that crude oil production should be raised to 47 million tonnes per year by 1996-97, and gas production to 50 million cubic metres, through the adoption of efficient early oil production and recovery systems.

Besides, oil production from existing wells, without harming long term prospects for more oil recovery, should be maximised through an efficient reservoir management system. The multidisciplinary approach should also include foreign and Indian private sector participation in the field of exploration and production, and utilisation of more gas to replace oil and oil products.

Stating that the approach needed a tremendous amount of planning and finance, he pointed out that the consumption of oil and oil based products in India was increasing steadily by six to seven per cent per year.

GANDHAR OILFIELD PHASE II CLEARED

The Cabinet Committee on Economic Affairs (CCEA) has cleared Phase II development of the Gandhar oilfield.

The project would yield an incremental oil production of 16.52 million tonnes and 18.14 billion cu meters of gas. It is expected that the total cost of phase II development of the Gandhar field would be Rs. 1,245.62 crore, including a foreign exchange component of Rs. 428.34 crore, excluding Rs. 257.17 crore already sanctioned under Phase I and Rs. 103.86 crore already spent on exploratory work by the ONGC under the Commission's powers.

PPL MAY FARE WELL IN CURRENT YEAR

The Paradeep Phosphates Ltd. (PPL) is likely to earn a net profit of Rs. 15 crores for '91-92 as against sustained losses in '86-87, '87-88 and '90-91. The losses were increased due to inadequate availability of phosphoric acid and ammonia and labour problems. The Minister of State for Chemicals and Fertilisers, **Dr. Chinta Mohan,** in a written reply in the Rajya Sabha recently said that the government of Nauru had expressed its desire to withdraw equity participation from PPL as the company was not likely to make pro-fits in near future and pay dividends to them.

Funds for Neelam oil-field tied up

The Exim Bank of Korea (Ko-Exim) has agreed to part finance the Neelam oilfield development project. According to information reaching Petroleum Ministry on April 30, Ko-Exim has agreed to extend $200 million credit to Hyundai Heavy Industry (HHI), the Korean giant holding letter of intent to develop Neelam oilfield. HHI has been in fact looking for a $400 million credit. The balance $200 million, it seems, will now have to be tied up from suppliers credit. Exim Bank had denied credit to HHI on grounds that Neelam did not fall into the priority list of India. Officials at New Delhi, however, said reasons for denying credit to HHI were "political in nature".

Clouded under this controversy, it appeared then that the Neelam project will not take off in time. The scheduled date of completion of the project is pre-monsoon 1993. Though under the contract, completion of the project is to be achieved by this time, HHI could have got an extension on some grounds or the other. For India, development of Neelam oilfields is of prime importance as it would go a long way in reducing imports of crude oil. It has reserves of about 150 million tonnes. Located about 45 kms south-west of Bombay, the oilfield has already been producing oil since March, 1990 at a rate of about 10,000 barrels a day. It is expected to produce 11.5 million tonnes of oil in the entire Eighth Plan period.

Production at the Neelam oilfield is currently being done with temporary deck facilities for four wells, from where crude is being sent to the adjoining Heera field for processing through a sub-sea pipeline. The full development plan as approved by the Cabinet includes drilling of 100 oil wells to be done by ONGC which will be connected to 12 oil well platforms from where fluids will move on to a process complex. The process complex is envisaged to have a provision for water injection facilities from the beginning itself to maximise recoveries. Expected to cost about Rs. 800 crores, it is being designed to handle oil up to six million tonnes annually, while the water injection platform will handle 2.3 lakh barrels of water per day.

ALLOWING METHANOL, ETHANOL MIX IN DIESEL UNDER STUDY

The Government is considering the issue of giving permission to mix methanol and ethanol in diesel, the Petroleum and Natural Gas Minister, **Mr. B. Shankaranand,** said in the Lok Sabha on April 30.

23% gas flared

The Minister also noted that about 5500 million cubic metres of natural gas were flared during the period from January, 1991, to March, 1992, which was approximately 23 per cent of the total gas produced in the country. The flared gas is valued at Rs. 700 crores at the selling price current at the relevant time, Mr. Shankaranand said.

ONGC's gas flaring reduction project was being implemented in the western offshore. Projects for reducing flaring of gas in Gujarat and Assam are also being implemented. Against a production of 17998 million cubic metres of gas in 1990-91, the utilisation was 12836.62 million cubic metres. The expenditure allocation to gas production was Rs. 1,700.45 crores while the revenue was Rs. 1,678.34 crores.

Oil probe technique

In reply to another question Mr. Shankaranand said a new oil exploration technique, had been put to use in the western region to collect reliable data about oil reserves. The technique had been used in various places, including Balol, Jotana, Linch, Nandasan, South Kadi-Viraj, Nada and Limbodra in Gujarat.

Stress on safety in oil industry

The Ministry of State for Petroleum and Natural Gas, **Mr. S. Krishna Kumar,** has cautioned the oil industry that one of the problems with automated systems is that quite often individuals become complacent as they feel that the system will take care of the problem itself.

He said good training of the personnel in charge on the newer and technologically more complex systems and alertness to look out for changes with a view to anticipating possible system upsets are essential in the continuous process industries.

Inaugurating the two-day safety workshop organised by the Oil Industry Safety Directorate in New Delhi on April 29, the Minister said it is commendable that the experts and the professionals of the industry offer assistance to formulate national standards of self regulatory nature for promoting safety. "It is noteworthy that the industry has started making disaster management plans and is updating them from time to time with hazard analysis studies", he added. He said there is much to learn from the interchange of experience and knowledge, which workshops of this type facilitate, and derive benefits that can be translated in pursuit of safer workplace. He stated that through discussions on case histories it may be necessary to see our failures i.e., the areas where we had gone wrong so that similar mistakes do not occur again.

Mr. Krishna Kumar warned that all the accidents have been due to the failure to foresee the dangers and assuming that the system is fail-safe. He said while we are going ahead upgrading and modernising our hardware and technical systems, we have to look at the human systems also considering that we have over 1.2 lakh persons engaged in the industry. He further stated that it is significant that efficiency of safety performance and efficiency of production go hand in hand. Unsafe situations lead to plant outages losing production and sometimes accompanied by huge expenditure for repairs, he added. Delivering the keynote address, **Mr. K.N. Venkatasubramanian,** Chairman of Indian Oil Corporation, emphasised on the need of safety for enhancing the productivity. He said safety depends on proper designing and direction, industrial practices, observance of operating instructions and safety drills, and by eradicating unsafe practices.

SAFETY — A CONTINUOUS PROCESS

The Union Petroleum Minister **Mr. B. Shankaranand,** has cautioned the oil industry that safety is not a one-time achievement but it has to be a rule and a continued process. Presenting the Oil Industry Safety Awards in New Delhi on May 1, he said that the petroleum sector was hazardous in nature and accidents could lead to devastating loss of life and property. He urged the industry to use high safety standards as it was a substance used not only by oil companies but large volumes were handled by segments like transporters and dealers also.

Indian Oil Corporation bagged the award in the category of best refinery installation for the year 1989-90 and the best LPG marketing organisation for both 1989-90 and 1990-91. Indian Oil Blending Company, a subsidiary of IOC was judged the best marketing organisation (excluding LPG) for the year 1989-90. Haldia Refinery's performance was judged best among 12 operating refineries for 1989-90. The other companies who were awarded this year include Hindustan Petroleum Corporation (process and production organisation), Vizag Refinery (refinery installation), IBP (marketing organisation) and Oil and Natural Gas Commission (cross country pipelines).

Essar's to acquire two tankers for oil transport

Controversy surrounds the decision of the Shipping Acquisition Licensing Committee (SALC) of the Surface Transport Ministry to allow the Essar group to acquire two oil tankers for transporting imported petroleum and petroleum products into the country.

Official sources point out that Essar was given the permission without any open tenders being opened for this purpose. Moreover, a private sector company has been allowed entry into this oil cargo transportation business in spite of the fact that the government has so far been entrusting the state-owned Shipping Corporation of India (SCI) with the sole responsibility of acquiring oil tankers and undertaking oil cargo transportation.

The Essar group is reported to have bagged an assured five year contract of Rs. 450 crore from the Oil Co-ordination Committee. Industry sources said that if the government wanted entry of private sector in the oil cargo, then Oil Co-ordination Committee (OCC) should have gone for open tenders to enable other private sector shipping companies to participate in the tender.

Shipping Corporation of India is also reported to be upset over the entry of the Essar group in oil tanker business. Shortage of vessels in SCI was cited as one of the main reasons by OCC in recommending the name of Essar group to the Ministry of Surface Transport. Sources pointed out that Shipping Acquisition Licensing Committee showed undue haste in clearing the Essar group's application of acquiring oil tankers for use by OCC.

Essar is also reported to have begun lobbying for an early clearance for acquisition of two oil tankers as it had already placed orders for two oil tankers of the value of dollar 59 million each. The Essar group, it is said, has placed orders with Samsung Shipyard of Korea. The entire financing package is believed to have been financed by the subsidiary of Standard Chartered Bank, London.

A senior official of SCI, when contacted in Bombay, said that entry of Essar group would have serious long term repercussion for the public sector shipping company. It would be very difficult to deny entry to other private shipping companies having once allowed one private company, he said.

The official said that SCI felt let down by its own administrative ministry for ignoring its interest. He said that SCI's request for acquisition of oil tankers had been pending with the government for last three-four years.

The proposals, having been vetted by the Ministry, had to be cleared by the Planning Commission and Finance Ministry. Then it had to cross the hurdle of going to the Project Investment Board. Its request had been turned down on the plea of scarcity of foreign exchange.

The SCI official further added that private sector companies like Essar had a great deal of flexibility in their decision making. The public sector companies did not enjoy this luxury. He stated that the corporation had served the oil industry in good and bad days.

SCI had stood by ONGC during the early eighties when the shipping industry world over had been going through a severe recessionary phase. Now when there was boom in the shipping line, it had shifted its preference to private sector.

A senior official, requesting anonymity, in the Surface Transport Ministry confirmed that Shipping Acquisition Licensing Committee was under tremendous pressure to grant permission to Essar group to acquire two oil tankers. The move was made by OCC saying that SCI was not in a position to supply vessels forcing it to go for chartered vessels.

OCC is reported to have told the Ministry to consider entry of select private sector companies who could be given long term contract. He said that the OCC request was ably supported at the highest level in the Ministry.

The official said that move was certainly not in the interest of the country and particularly of SCI. He admitted that it would be difficult to sustain pressure from other shipping companies to enter into oil cargo business. He did not rule out foreign liners also entering the fray underpricing the domestic liners.

According to the official, freight in such cases is settled on 'cost plus' basis. The shipping companies are paid the actual fixed, variable and capital cost plus a fixed return of 12.5 per cent. He said that it was very difficult to define what the actual cost would be and there lay the catch for making a killing. The official said that SCI should have been spared the current 'adventurism of competition' as the rules of the game were heavily loaded against it.

RSP FACE-LIFT PLAN CLEARED

The government recently cleared the revised modernisation plan for the Rourkela Steel Plant (RSP) at an estimated cost of Rs. 3,954 crores.

Official sources said the Cabinet Committee on Economic Affairs, chaired by the Prime Minister, **Mr. P.V. Narasimha Rao,** approved the scheme which includes a foreign exchange component of Rs. 714 crores. The two-phase modernisation is expected to be completed by December 1995.

Captive power plants hit by coal paucity

Industries with captive power plants (CCP) have been taken by surprise by a sudden decision of South Eastern Coalfields Ltd. (SECL), not to allocate coal under the CPP priority category, according to a report in *The Financial Express*.

The decision, likely to have been taken by all collieries, has thrown the industry in a quandary as they would now have to function under the meagre allocation for users under the non-core sector category.

The refusal of SECL to accept programmes for coal movement under the CCP priority is in defiance of the decision of the Cabinet Committee of Industrial Infrastructrue to accord some 10 units with CPPs the highest status — the ELC (electricity/power) priority.

Further, the decision by SECL was made despite the Standing Linkage Committee under the Department of Coal having accorded CPP priority for the quarter April to June, 1992.

Compounding the crisis further, industry would have to face uncertain availability of coal under the non-core sector category as the Railways have intimated to the Coal Department a reduced target for coal movement.

At a meeting convened by the Cabinet Secretary on March 23, the Railways revealed that they had reduced the target for coal movement from 157 million tonnes as fixed in the Railway Budget to 150 million tonnes for 1992-93.

This is expected to have serious implication for many industry sectors. Against a total requirement of 263 million tonnes of coal, the railways will be able to move only 150 million tonnes. An estimated 113 million tonnes would have to be carried by road, almost trebling the costs for industry units utilising coal.

As the railway target for the current year was only marginally higher than that of the previous year's 146 million tonnes industry sources have inferred that Coal India Ltd., does not have the capacity to meet the total cost demand which has increased from 241 million tonnes in 1991-92 to 263 million tonne this year.

Further, with an increased emphasis on road movement, sources point out that the smaller the coal movement by railways the greater is the opportunity for corruption. At the meeting, the Railways had complained that collieries were not loading where railway facilities were available and were resorting to road despatches.

A significant fallout of depriving industries with CPPs of regular and adequate coal supply would be the dependence of these units on the regional power grids. This would increase the load on the regional grids and further fuel power shortages.

Also these industries which include textiles, paper, sugar, vanaspati, heavy chemicals, rayon and viscose staple fibre will have to face higher costs. As it is the CPPs usually generate power at costs 50 per cent higher than in other power plants. Cost escalation will also come from the substitution of expensive foreign exchange guzzling furance oil for coal in boilers for steam application industries.

Ironically, the Government provides incentives for energy conservation for industries switching over to coal from furnace oil. The removal of priority status for CCPs has brought into focus once again industry's disagrreement with the divisions of industries into core and non-core sectors for the purpose of coal allocation. Under this classificatio apart from power, steel, cement, rai ways and fertilisers, all other industrie including heavy chemicals are classifie as non-core sector. CPPs were on a spe cial high priority category since 198

However, even under this priorit they were not treated on par with publi utility power stations. Actual supplie therefore, fell short of their require ments. With the collieries refusing t accept the CPP status, these plants ar expected to receive only about 20 pe cent of their total requirement of coal by sources.

After a representation from industr that the division into core and non-cor sectors was unfair, the Cabinet Com mittee on Industrial Infrastrcture ha ordered that certain industrial unit would have to be accorded ELC prio rity to the extent of the requirements, fo their captive power plant 'generating power on total energy system'. How ever, inspite of this order, Railways and Coal Departments refused to grant ELC priority and placed CPPs under a new group of industrial utility.

NTPC GAS-BASED PLANT IN KAKINADA

The National Thermal Power Corporation (NTPC) will set up a 400 mw gas-based power plant at Kakinada in Andhra Pradesh.

A NTPC spokesman said at Mudinepalli ONGC drilling area, about 40 km from Machilipatnam recently that large quantities of natural gas reserves were found both onshore and offshore in the country.

He said NTPC was making efforts to introduce and absorb the latest technologies available globally in the design, construction and operation of power plants through interaction with internationally renowned design organisations.

Vital role of NGO's in minimising risks stressed

An exceutive meet on "Management of toxic chemicals, hazardous cargoes and hazardous wastes" was organised by the Indian Institute of Chemical Engineers on April 18 at IFFCO, Kalol.

Addressing a group of about 30 participants, **Dr. Fred Millar,** Director, Environmental Policy Institute, Friends of Earth Society, Washington stressed that non government organisation (NGOs) have an important role to play in the minimisation of the risks arising out of emissions and accidents in chemical industries. He confessed that rich nations are the biggest polluters in the world and their policies ensure that poor nations remain poor. He added that Bhopal disaster has increased awareness about risks from chemical industry world over. He suggests that every industry should be asked to produce a document on "worst case accident scenario" of their plant which should be used for emergency planning. He opined that "right to know" movement should pick up so that public at large know what is being emitted by an industry.

Dr. Millar noted that a safety audit was carried out by experts in the plant of Union Carbide at Bhopal. Similar exercise was also carried out in the works of Union Carbide at Virginia USA. The report had indicated the possibilities of a disaster because of leakage from MIC tanks. But the contents of the report were not made known to the public. According to Dr. Millar US chemical companies are spending about $10 million per annum on public relations, under a programme termed as "Responsible care". The exercise aimed at building the image of their companies and trying to remove apprehensions of the public", Dr. Millar said. The motto is do not trust us but track us, he noted. Dr. Millar mentioned that as per Toxic Release Inventory (TRI) rules, the US chemical industry is expected to give report/data to Environment Protection Agency about the emissions from their plants in air, water and land. "Even this piece of information shall motivate an industry in reducing its emissions" he said. For example the Monsanto Chemical Industry was releasing 20 million pounds of toxic chemicals in air. When this was made known to the public, Monsanto announced a plan to reduce these emissions to 10% level in 4 years time.

Dr. Daryl Ditz from Centre of Environment, Cornel University, USA highlighted his Indian experience during his 7 months stay in India on a UN assignment in connection with hazardous waste management. In his opinion, small and medium industries in India do not get much regulatory attention. It was easier for authorities as well as public to focus on large industries. In his opinion there was lot of room for significant improvement in pollution levels in small and medium scale industries without incurring large costs.

While industry should declare the details of the hazardous wastes, it is the responsibility of State Government to identify different sites where hazardous wastes could be dumped. The objective of the industry should be to minimise the waste production by searching various alternatives and attacking the "source of pollution". He gave an examples of tannery industries near Kanpur which, with marginal investment, could reduce and recover chrome and thereby help in reducing pollutants being discharged to river Ganga while earning large returns on marginal investment. In his opinon, simple actions arising out of thought process rather than sophisticated technologies help in minimising wastes production/emissions.

In his inaugral address, **Shri K. Kailashnathan,** Additional Industries Commissioner, Government of Gujarat highlighted his experience as District Administrator before the pollution laws were enacted. Earlier, circumstantial evidence had to be collected, based on which industries were persuaded to improve rather than being threatened with closure. In his opinion, the level of public awareness on the hazards even in far off villages is very high. He highlighted his experience of 'mock exercise', as a part of offsite plan by the District Administration wherein people became panicky. He advocated that a balance has to struck between environmental conservation and economic growth, more so, since national boundries are being crossed because of air pollution.

Earlier, in his welcome address, **Shri. A.K.A. Rathi,** Chairman, Indian Institute of Chemical Engineers mentioned that mishaps world over have resulted into the formation of legislations be it Seveso directive of European Community after Seveso disaster or Environment Protection Act 1986 of Government of India, after Bhopal disaster. In the global scenario, except for fertilisers where India contributes 6-8% of worlds' total production, its production of many of the other chemicals is less than even 1 per cent. He added that there was no doubt that the public has a right to live in a clean environment. However, in a developing country, people have a right to get their basic needs fullfilled first. As such, the developing countries cannot afford to over-react on the environmental issues especially when chemical industry contributes in meeting the primary needs of the living beings. Chemical Engineers and technologists should make all efforts in ensuring safe conditions during manufacturing, handling and transportation of chemicals and install public faith, he added.

During the discussion, the participants opined that all the necessary information about hazards of an industry should be given to regulatory agencies and the authorities at different levels. Total information to the public at large may create panic. The multinationals, proposing to set up plants in India, should be enforced to follow the standards of their parent countries.

Rs. 6,000 crores needed for switching over to CFC substitutes

India will have to spend between Rs. 3,500 crores ($1,400 million) to Rs. 6,000 crores ($2,450 million) to switch over to substitutes of chloro fluoro carbons (CFCs) which contribute to ozone layer depletion according to a report in **The Financial Express** quoting an estimate prepared by a government committee.

A detailed assessment has been made by an inter-ministerial task force of the Government. But this exhaustive document that will have far reaching effect on the refrigeration and electronics industries is lying un-adopted at least for the last four months.

However, it is learnt that the Environment Ministry has stalled adoption of this report. The reason attributed to this delay is the developments that could occur after G-77 environment ministers conference at Kuala Lumpur.

At this conference, the developing nations are scheduled to take a common stand on various environmental issues to be raised at UNCED including CFCs directly responsible for climate change.

Once, India signs the Montreal Protocol which includes phasing out CFCs, the switch over process will begin. While the base year is 1997, the draft report of the inter-ministerial task force says that it can be done by 2007. The task force has also recommended that no restriction be imposed on manufacture of CFCs in India till 1997 as the consumption in the country is 'insignificant' in relation to westernised nations. As per data compiled by the task force the per capita consumption of CFCs is just 8.8 grams/year and it could just go upto 20 grams/year in 2005.

According to Montreal protocol, the per capita consumption could be as high as 300 gms. But in contrast 87.6 per cent of CFCs produced are consumed by developed countries with the poorer nations taking in only 12.4 per cent (as per 1986 data).

CFCs are basically used as cooling agents in refrigerators and air conditioners. They form the basic material to make foams for use as insulating material, as propellants in aerosols and cleaning agents in the electronics industry. They also function as solvents in different applications.

However, the amounts specified for switch over to CFC substitutes does not include recycling, destruction of present equipment and also social costs. Moreover the estimates for switch over were made by the task force as per the 1992 prices but there is every likelihood for cost over runs.

The figures are different from the study of **Mr. Touche Ross,** a British consultant who was commissioned by Overseas Development Agency (ODA) in 1989 to assess the financial implications of the switch over. Mr. Ross has estimated an expenditure between Rs. 500 crores-Rs. 3,000 crores for switch over.

The switch over will be possible once the funds and technology are made available under the protocol on easy terms either in the form of aid or soft loan and know-how for substitutes was transferred. The funds and technology will be available once the protocol is signed and ratified by at least 20 countries. At present 18 countries have ratified the Montreal protocol.

The interim fund of $160 million constituted at the London Conference of UN will be absorbed into the permanent funding facility once the protocol is ratified by the requisite number of countries. In the transitionary phase requirements could be met from interim funds. The task force has also recommended constitution of a national centre to undertake research and develop CFC free alternatives for the refrigeration as well as electronics industry. In the report, the task force not only proposed the consumption levels of various CFCs but also projected the demand by 2005. At present while the CFCs production is 20,000 tonnes per annum, it can be easily jacked up to 30,000 tonnes by making certain changes in the processes and removing bottlenecks. In addition already two plants are being set up which will take up the production by 2000 tonnes and two other plants in the offing will begin their production with installed capacity of 600 tonnes by '94. All the four plants will be basically catering to the refrigerating industry.

IMPORT DUTY WAIVER FOR ECO-RELATED MACHINERY

Out of its environmental concerns, the Government proposed total exemption from the whole of import duty certain specified machinery used in the manufacture of fly ash and phosphogypsum bricks and building materials. The exemption was announced by the Finance Minister, Dr. Manmohan Singh while introducing the Financial Bill in the Lok Sabha.

While presenting the Budget, the Finance Minister had proposed to reduce import duty on these items to 40%. He said it had been represented that the concessions announced earlier during the presentation of the Budget are inadequate as the initial cost of investment for such projects is too high even at the reduced rate of duty. He said in view of the environmental importance of this activity, he now proposed total exemption of the specified machinery used in this sector from the whole of the import duty.

HCL posts lower sales, higher profits

The sales of copper by Hindustan Copper Ltd. (HCL) went down by 19 per cent in 1991-92 compared to the previous year, yet the public sector company which enjoys monopoly over the production of this important industrial input managed to increase its profit by 14 per cent.

Despite restrictions on import of copper in 1991-92, the sales went down from 64,558 tonnes in 1990-91 to 52,266 tonnes in 1991-92. However, due to scarcity created by restrictions on import, the monopolistic position helped the company to increase its turnover as well as profits. HCL achieved a record turnover of Rs. 661 crores as against Rs. 639 crores in 1990-91.

Similarly, the company is expected to earn a pre-tax profit of Rs. 51.40 crores against the MoU target of Rs. 35 crores. The increase would be about 14 per cent as compared to 1990-91. As far as the physical performance was concerned, HCL's output in the metallurgical sector was higher than in the previous year. However, there has been a shortfall in ore production and metal concentrates particularly in the Ghatsila unit during 1991-92 as compared to the preceding year.

The shortfall was mainly due to fall in mine grade in certain mines and adverse power supply position at Ghatsila. During the year, the production of blister copper and refined copper (cathodes) went up to 46,755 tonnes and 45,495 tonnes respectively. In terms of capacity utilisation, the company achieved 98 per cent utilisation in the mining sector and 97 per cent in the metallurgical sector during 1991-92.

The Taloja continuous cast copper (CC) wire rod plant in Maharashtra continued to suffer on account of shortage of feed stock. HCL had set up this sophisticated CC rod plant at Taloja applying the world renowned Southwire technology (SCR-2000) of the US and uses natural gas as energy source. The plant based on imported cathodes was commissioned in March, 1990 but has not been able to operate at full capacity on account of shortage of feed material due to pau-city of foreign exchange. The production of CC rods from the plant came down from 21,636 tonnes in 1990-91 to 14,607 tonnes in 1991-92.

The company, however, is proposing to double the production of CC rod at Taloja. According to the draft MoU for 1991-92 being finalised by the Ministry of Mines, the target for production of CC rods has been fixed at 30,000 tonnes. The MoU envisages a lower profit of Rs. 41.06 crores for 1992-93 against the actual of Rs. 51.40 crores in the preceding year.

COCONUT SHELL CAN BE A MONEY-SPINNER

The coconut shell is no longer a begging bowl, it can be a money spinner in the export market as it has attracted attention in the West for use in packaging food items. European countries like Germany, the Netherlands and Austria are in the process of enacting legislative measures to curb or minimise the visible waste and encourage bio-degradables and re-usable materials for packing foodstuffs in place of synthetic packaging.

These regulations in the West would prompt the food industry to search for alternate materials for packaging. This is a favourable condition for India to promote exports of coconut shells, a top official of the Coconut Development Board said in an article in the *Indian Coconut Journal.*

A well known Spanish company has already arranged for the import of over 600,000 shells from three copra processing units in Kerala where 90 per cent of the coconut shell is produced. These shells would be used to serve ice creams in the Barcelona olympic games. According to the Coconut Development Board, more export enquiries are being received from Spain and Italy. The Board expects the demand for the shell to grow which will boost the coconut-based industry in Kerala.

The shell which was hitherto under-utilised is sure to find new uses as containers and receptacles throughout the world if planned market promotion initiatives are taken, said the chief coconut development officer **Mr. V.T. Markose.**

INDIA TO HELP BHUTAN SET UP MINERALS TESTING LAB

India is to help Bhutan in the setting up of a mineral testing laboratory. This was stated by the Minister of State for Mines, **Mr. Balram Singh Yadav,** in his talks with the Bhutan Minister for Trade and Industry, **Mr. Lyonpo Om Ptadhan,** at New Delhi recently.

In response to the Bhutanese Minister's request for assistance in development of tungsten and graphite deposits, Mr. Yadav mentioned that for tungsten a feasibility study was nearing completion by the Hindustan Zinc Ltd., (HZL).

COAL SUPPLY TO BTPS CURTAILED

The Badarpur Thermal Power Station (BTPS) has received a lower supply of in coal during April against the prorata linkage. This is due to non-payment of outstanding dues to BTPS by DESU amounting to more than Rs. 1,700 crores resulting in corresponding non-payment to the Railways and Coal India Ltd. BTPS is trying to impress upon the Railways, Coal India and DESU the urgency of the situation and the need to keep the power station running, so that the station is not constrained to shut down the remaining units which may affect the power supply position in the capital.

100,000 tpa sponge iron unit coming up near Bangalore

Kusum Alloys Limited, part of the Rs. 52-crore Bangalore-based Kejriwal group, is setting up a Rs. 6.6 crore 100,000 tonnes per annum sponge iron plant at Whitefield near Bangalore.

At present Kusum Alloys is importing scrap directly from the United States, United Kingdom, Singapore and the Middle East as raw material for its ingot plant.

As part of the sponge iron project, Kusum Alloys is also putting up a continuous casting machine at a cost of Rs. 40 lakhs. To finalise the proposed diversification, Kusum Alloys is planning to enter the capital market in July this year. While the public issue is likely to be around Rs. 4 crore, the promoter's contribution will be about Rs. 1.5 crores.

Mr. A.R. Kejriwal, managing director, Kusum Alloys, told *The Economic Times* recently that the sponge iron plant would come up near the company's ingot manufacturing unit at Whitefield. Civil works are nearing completion.

The plant will come up in stages. In the first phase, the capacity will be about 15,000 tonnes. Mr. Kejriwal expressed optimism that full capacity would be attained by the end of the first year.

The iron ore will come from the Hospet region of Bellary district while coal will come largely from Indian coal fields. The company is also exploring the option of importing coal against their exports.

Referring to a host of companies getting into the sponge iron business, Mr. Kejriwal said Kusum Alloys would not be facing any problems in marketing as the group's rerolling plants which produce cold twisted bars will take up most of the production. Utility Alloys Private Ltd., part of the Kejriwal group, is in the rerolling business with a plant at Avinashi in Coimbatore district of Tamil Nadu. This company has an installed capacity of 24,000 tonnes per annum.

The rationale in going in for a sponge iron plant appears to be the considerable difference in the cost of producing steel ingots from scrap as opposed to sponge iron. Mr. Kejriwal claimed that steel ingots produced from sponge iron were cheaper by about Rs. 1,500 per tonne. Mr. Kejriwal also said the company had already obtained the clearances from the pollution board.

As a long term strategy, Kusum Alloys plans to export about 75 per cent of its production. The Kejriwal group has already made a beginning by bagging a trial order for export of 1,000 tonnes from the United Arab Emirates.

In a bid to make use of the heat generated during the manufacturing process, the company is also setting up a 2 mega watt gas turbine power generating unit. For the year ending March 1992, Kusum Alloys has recorded a turnover of about Rs. 12 crores.

ZINC PRICES REVISED

Hindustan Zinc Ltd. (HZL) has announced the prices of various categories of zinc which will be operative from May 1. Electrolytic high grade zinc from Debari/Vizag/Chanderiya is to cost Rs. 58,000 per metric tonne (pmt).

In the north zone stock points of Delhi, Ghaziabad, Faridabad, Jagadhri and Chandigarh, it will cost Rs. 67,500 pmt. For east zone stock points of Calcutta and Jamshedpur, the price has been fixed at Rs. 66,500 pmt.

For Bombay, Thane, Pune, Nagpur and Nanded falling under the west zone stock points, price will be same as in the case of east zone stock points. It will cost Rs. 66,000 pmt for consumers at Bangalore, Madras and Indore. However, the price in Ahmedabad stock point will be Rs. 67,500 pmt. Special high grade zinc will cost additional Rs. 300 pmt on the respective price as applicable at respective stock points.

Similarly, PW zinc will cost Rs. 500 less than the respective price as applicable at respective stock points. Lead (99.77%) will cost Rs. 34,000 pmt from Vizag, Tundoo and Chanderiya. Elsewhere, it will cost Rs. 39,000 pmt.

IISCO PLAN TO STEP UP PIG IRON OUTPUT

The Indian Iron and Steel Company (IISCO) would set up a new pig iron casting machine at its Burnpur works with a view to increasing the level of pig iron production, according to IISCO sources.

The sources said that expenditure would be restricted to Rs. 2.9 crore as it would be constructed primarily with in-house efforts and this machine, which would go on stream in November, would produce 600 tonnes of pig iron, daily.

Since 1987-88 there had been a spurt in pig iron production in the Burnpur works, the sources said, and added that a record production of 3,88,757 tonnes had been achieved in 1991-92.

The spurt in pig iron production was one of the reasons for the turnaround of the Burnpur works whereby it could earn a profit of Rs. four crore in 1991-92, the sources said, and added that the plant was poised to earn a profit of Rs. 25 crores in 1992-93.

The Burnpur works of IISCO has also initiated the site work for the installation of a new oxygen plant, to be commissioned by December 1993, at an estimated cost of Rs. 33 crores.

307 projects' cost escalates by 35%

The cost of 307 projects being monitored by the Department of Programme Implementation has escalated sharply by 34.9 per cent and the progress of 177 of these was behind schedule. The cost of the projects has risen from the latest approved cost of Rs. 70,043 crores to Rs. 94,511.5 crores, according to the annual report of the department for 1991-92.

Only eight of the projects were progressing ahead of schedule, 122 were on schedule and the rest were behind schedule, during 1991-92. The monitoring system was improved in February last making it more effective and result-oriented. The performance of all infrastructure sectors, except power, hot metal, railway revenue, earning and cargo handled at major ports in April-December 1991 was below the target for the period.

However, as compared with the achievement of April-December 1990, the performance of all the sectors, except telephone instrument production, crude oil and refinery throughput, recorded a positive growth, says an official release on the report.

The infrastructure monitoring division is engaged mainly in the task of keeping a watch on the performance of core industrial infrastructure sectors, including power, coal, steel, railways, telecommunications, shipping and ports, fertilisers, cement, and petroleum and natural gas which have a vital role in the country's economic development. With the liberalisation of industrial and trade policies, only coal, petroleum, and railways, of the core infrastructure sectors, continue to be in the reserve list while the rest have been opened up for private sector participation.

During the year, the department initiated several steps to ensure a smooth functioning of the core industrial infrastructure sector. In the process, bottlenecks faced by some of the sectors were identified in the light of which corrective action was conveyed to the concerned administrative ministries. The division also monitored the physical targets set for the year for all the nine sectors and prompted timely action on the part of the administrative ministers to ensure attainment of the targeted levels of production. As on January 1, 1992, out of a total of 307 projects, covered by the monitoring system, 128 projects, each costing Rs. 100 crores and above, accounting for nearly 90 per cent of the total investment were intensively monitored through the system of flash and exception reports. All the projects were subjected to quarterly review and the progress was reported to the Cabinet at the end of each year. During 1991-92, ten projects had been completed up to December 1991, while 70 projects were completed during 1990-91.

PATENT PROTECTION:

Government urged to protect domestic interests

The national working group on patent laws recently asked the government to delete the linkages between the different treaties being negotiated under the Dunkel proposal with the right of rejecting or accepting individual treaties.

In a just concluded two-day national dialogue on international pressure and the economy of India in Jaipur where participants included the former Prime Minister, **Mr. Chadrashekar,** and the former Finance Minister, **Prof. Madhu Dandavate,** a statement issued by the working group asked the government to ensure the sovereign and democractic right of Parliament to legislate changes in India's laws and policies.

It resolved that the government must protect the interests of the Indian farmers and growth of Indian agriculture and its self-reliant development. Further, minimum market access for agriculture products should not be granted for it would impose binding constraints on our policies and our food security would be threatened, it warned. The working group said the government should reject the Trade-Related Intellectual Property Rights (TRIPs) text and seek renegotiation. Other developing countries would certainly rally behind this approach and their support should be sought.

The proposed ten years period for changing our laws should be totally free from classical pipeline protection and exclusive marketing rights, it said. Referring to the Trade-Related aspects on Investment Measures (TRIMs), the group said the text offers freedom to foreign investors for operations in domestic markets with no obligation for them to use local inputs. The scope of transfer of technology in areas where technological gaps prevail would be hindered. It also resolved that our national interest and development priorities in the service sector should not be compromised and asked the government to seek the integration of textile and clothing trade into the GATT within a period of five years.

It said the government must ensure that our decision-making processes should not be externalised at the hands of international institutions and it should insist on special and differential treatment.

FINAL VIEW ON DUNKEL DRAFT ONLY AFTER PARLIAMENT DEBATE: CHIDAMBARAM

The Minister of State for Commerce, **Mr. P. Chidambaram,** has said that the government would take a final view of the Dunkel proposals only after a full debate in the Parliament. He was addressing the Parliamentary Consultative Committee of the Ministry o Commerce which met in New Delh under his chairmanship and resumed th discussions initiated at the last meetin on the text of the proposals submitte by **Mr. Arthur Dunkel,** Director Gen eral of GATT, for the consideration o participating member countries in th Uruguay round of multilateral trad negotiations.

Mr. Chidambaram emphasised tha the government's efforts would be t maximise the advantages of India an to seek improvements and changes i the draft in the areas of vital concern t the country so that its interests wer fully protected. The members expresse the view that the country's interest should be safeguarded in the key area of negotiations including textiles, agr culture, trade-related intellectual prop erty rights (TRIPs) and services. The also said that the interests of the deve loped and the developing countrie could not be treated on the same footin

Foreign investment approvals up four-fold

The foreign investments approved in 1991 were more than four times those approved in 1990, says the annual report of the Department of Industrial Development in the Ministry of Industry for 1991-92. Foreign investments approved during the post-policy period of 1991 (August to December) were more than nine times the investments approved in the corresponding period in 1990, i.e. Rs. 412.79 crores as against Rs. 45 crores.

Under the automatic procedures for approvals, the Reserve Bank of India (RBI) has approved foreign investments of Rs. 142.24 crores within a short period of three and a half months (January 16 to December 31, 1991). This accounts for about one fourth of the total foreign investment approved in 1991 and is more than the entire investments approved in 1990.

The Secretariat for Industrial Approvals has approved foreign investment worth Rs. 270.55 crores during the post-policy period. This is more than double the entire foreign investments approved in 1990 and more than half of that approved in 1991.

The total number of foreign collaboration approvals in the post-policy period are 634 as compared to 239 in the corresponding period in 1990. The total number of foreign collaboration approvals involving foreign investment (foreign equity) is 201 against 64 in 1990.

Following the announcement of the new industrial policy the Foreign Investment Promotion Board has approved nine proposals involving investment of Rs. 221 crores. The report says that RBI will give automatic approval to a company wishing to raise its foreign equity from existing levels of 51 per cent if it does so as part of an expansion programme. The expansion programme must be in high priority industries. The additional equity should be part of financing of the expansion programme and money to be remitted should be in foreign exchange.

Non-resident Indians and overseas corporate bodies owned by them are permitted to invest up to 100 per cent foreign equity in high priority industries with full benefits for repatriating capital investment and income accruing thereon. Such proposals will receive automatic approval from RBI if the foreign equity covers the foreign exchange requirment for imported capital goods and outflow on account of dividend payment is balanced by export earnings over a period of seven years from the date of commencement of production.

There was a moderate increase in consents for capital issues for raising funds from the capital market. The number of approvals granted by the Controller of Capital Issues for raising fresh capital increased from 847 during 1989-90 to 918 during 1990-91. In terms of value, however, consents for capital issues registered a decline from Rs. 13,028 crores during 1989-90 to 9,261 crores during 1990-91.

The financial assistance sanctioned by all financial institutions for 1990-91 was Rs. 20,531.5 crores compared to Rs. 16,005.4 crores for the previous year, showing a rise of 28.3 per cent. The composite industrial growth of six infrastructure industries comprising electricity, coal, saleable steel, crude petroleum, petroleum refinery products and cement with a total weight of 28.8% recorded a growth of 7.3% during April-November, 1991 over April-November 1990. The industries which have shown a rise include cement (11.7%), coal (11%), saleable steel (11%) and electricity (9.4%). The annual average production growth during the Seventh Plan was estimated to be 12.7% (at constant prices) and was estimated to have grown at 8.5% during 1990-91.

Tax concessions, import duty relaxations announced

The Union Finance Minister, **Dr. Manmohan Singh**, has announced further direct and indirect tax concessions of Rs. 602 crore. The major concessions include restoration of tax deduction benefits under Section 80-L of the Income-tax Act, reduction in the long-term capital gains tax on firms and venture capital companies and a 50 per cent cut in the gold import duty from Rs. 450 to Rs. 220 per 10 grams.

Other key tax concessions include a hike in the ceiling on tax-deductible investment level under Section 88 from Rs. 50,000 to Rs. 60,000 extension of the scope of the new simplified procedure for taxation of small retail traders to cover other small shop-keepers, modification in the taxation of partnership firms to further help smaller companies, restoration of import duty concessions for drug intermediates and raw materials for electronic components, reduction in export duty on finished leather and unpolished granite and increase in import duty on computers and computer peripherals.

With these announcement, made while moving the Finance Bill, 1992 for consideration in the Lok Sabha, the Finance Minister has conceded a total revenue loss of Rs. 847 crore. Earlier on March 26, Dr. Singh had announced import duty relief of Rs. 245 crore.

The Finance Minister proposed to reduce the long-term capital gains tax rate in the case of firms, association of persons and bodies of individuals from 40 per cent to 30 per cent. He also proposed a concessional rate of 20 per cent in the case of venture capital companies. In his budget, he had earlier proposed tax on long-term capital gains at a flat rate of 20 per cent in the cases of individuals and Hindu undivided families, 40% on firms and association of individuals and 30% in all other cases. Referring to the modification he had introduced in taxation of partnership firms with a view to avoiding double taxation of the same income in the hands of both the firm and the partners. Dr. Singh said that he had proposed to exempt partners from the taxation of their share income from the firm. He had also proposed to allow deduction towards interest and salary payment made to partners from the income of the firm.

The deduction in respect of salary was proposed at the rate of 90 per cent of the first Rs. one lakh in the case of professional firms and on the first Rs. 75,000 in the case of business firms. In order to help smaller firms, the Finance Minister has now proposed to allow 100 per cent deduction of partner's salary up to Rs. 50,000 from the firm's income.

Concessional duty for drug intermediates

On indirect taxes front, the Finance Minister said the concessional import duty of 95% on certain specified drug intermediates used to produce bulk drugs had been removed. As a result, inputs as well as the finished products such as bulk drugs attract the same rate of duty of 110%. The Minister, therefore, proposed to restore the concessional import duty of 95% in respect of these specified drug intermediates. He also proposed to completely exempt specified formulations of certain life-saving drugs and medicines from import duty. The excise duty on sterile solutions used for the care of contact lenses is also being reduced from 105% to 15%. The Finance Minister also proposed reduction in import duty on aseptic form fill seal machines for the pharmaceutical industry from 50% to 40%. The import duty on specified items of machinery used for manufacturing fly ash and phosphogypsum bricks and building components, which was reduced to 40% in the budget, is being wholly withdrawn in view of the environmental importance of this activity.

Export duty on finished leather reduced

The export duty of 10 per cent levied on finished leather and unpolished granite in order to encourage exports of more value-added products is being reduced to five per cent and seven per cent, respectively, since it is felt that the duty was heavy.

Duty on ethyl benzene down

The Finance Minister also proposed to reduce the import duty on ethyl benzene, a raw material used for manufacturing styrene, from 40% 25%.

TRADE, INDUSTRY HAIL TAX CONCESSIONS

Trade and industry associations have welcomed the tax concession announced by Dr. Manmohan Singh. The tax concessions would give marginal relief to taxpayers and industry, according to the **Federation of Indian Chambers of Commerce and Industry** (FICCI). The partial restoration of 80-L, increase in tax rebate in respect of specified investments and broad-basing coverage of investment would help middle income tax payers, FICCI said.

FICCI, however, felt that at a time of decline in industrial production, the Finance Minister should have spelt out measures which could boost production and exports. It was pointed that additional production could be exempted from excise if one-third of it was exported. Further, it was necessary to initiate steps towards introduction of a comprehensive value-added tax to minimise the cascading effect of indirect taxes.

The **PHD Chambers of Commerce and Industry** (PHDCCI) while welcoming the tax and duty concessions announced by the Finance Minister, stated that the measures would encourage small investors and stimulate industrial growth.

PHDCCI, however, also said that the Finance Minister should have restored full deduction under section 80-L to give relief to taxpayers from the lower tax bracket. The rationalisation of taxation of partnership firms had removed the anomaly of double taxation and was a big relief to small partnership firms, PHDCCI said. PHDCCI was hopeful that the rationalisation of wealth tax provisions as announced by the Finance Minister would be up to the aspirations of trade and industry.

Leather exporters plea to continue lower duty

The finished leather exporters, while welcoming the reduction in the export duty from 10 per cent to five per cent have, however, urged the government to continue the policy for at least five years.

Such a stable policy will help the exporters plan and sign contracts without being apprehensive of sudden changes and consequent losses during the period, according to **Mr. M. Rafeeque Ahmed,** Chairman Indian Finished Leather Manufacturers and Exporters Association. Finished leather forms the major item in the country's leather export basket, contributing as much as Rs. 765.61 crores in 1990-91.

Export has also been growing steadily over the years. More important, export of leather products has also been going up with the necessary back-up from the finished leather sector. A stable policy for finished leather export will, therefore, help the country achieve the target of 10,000 crores set for the turn of the century, Mr. Ahmed feels.

NEW PROCEDURES ANNOUNCED: EXIM NORMS FURTHER EASED

The government has released the new Handbook of Procedures for Import and Export which has simplified the procedures and is aimed at making the compliance and administration easier. As per the new handbook, the application forms required for import of various items in the Negative List have been reduced from seven to one. Similarly for exports, only one form has been prescribed. Legal undertaking and bank guarantee forms have been reduced to one. Also all the forms have been made computer compatible. As far as Duty Exemption Scheme for exports is concerned, the application format has been simplified and the number of enclosures have been reduced to two. More powers have been given to Licensing Authority for grant of extension in Export Obligation Period. The handbook envisages redemption of bond/LUT without audit and issue of No Objection Certificate by Customs.

For project exports, the procedures have been clearly defined. These proposals will be considered by the Projects Committee in the Ministry of Commerce on production of a copy of the turnkey project approved by Exim Bank, contract documents and an essentiality certificate from a chartered engineer. Terms and conditions in respect of 46 items/categories mentioned in Part Five of the Negative List, which may be exported without a licence, have been simplified and multiplicity of controlling agencies have been reduced.

Export procedure for exports of exhibits of items included in Parts Three, Four and Five of the Negative List of Exports, for display in exhibition, fairs, festivals etc. has been permitted without a licence if the value of the exhibits does not exceed Rs. 1 lakh in respect of each event and if the exhibits are re-imported within 30 days of the closure of such exhibitions.

Export policy and procedures for export of bonafide trade samples has been further liberalised. Samples of goods included in Parts Three, Four and Five of the Negative List of Exports may be exported without licence upto a value limit of Rs. 25,000 in any licensing year as against the limit of Rs. 10,000 in the policy for 1990-93.

With regard to importer-exporter code (IEC) number the procedure for grant of IEC has been simplified. Certain categories will continue to be exempted from obtaining IEC number. As far as EPCG scheme is concerned, the export obligation with respect to import of second-hand capital goods under the scheme as a multiple of the value of the capital goods as given in Paragraph 38 of the Policy shall be reckoned with reference to the c.i.f. value of the corresponding new capital goods.

The application shall be considered by a committee headed by the CCI & E. Cases of import of c.i.f. value of more than Rs. 10 crores shall be considered by a committee headed by the Commerce Secretary.

SAIL MAY INCUR HEAVY LOSS THIS YEAR

After making profits for eight consecutive years, Steel Authority of India (SAIL) is likely to incur a heavy loss in the current financial year. SAIL which operates five integrated plants in the country, apprehends a loss of around Rs. 600-650 crores in the current year as against a profit of over Rs. 280 crores last year.

The galloping increases in the price of three of its prime inputs and lack of compensation for these hikes were the main reasons for the massive loss, official sources said.

While the base price of iron and steel items was last raised in September 1990, the railway freight, power tariff and coal prices had increased manifold since then, the sources said, adding the devaluation of the rupee had made imports of spare parts and coking coal costlier thus increasing the overall costs.

SPOTLIGHT ON
Biotechnology & Life Sciences

BREAKTHROUGH IN MALARIA RESEARCH

A Chinese herbal drug which has been found to be very effective in curing cerebral malaria may soon be available for treatment in India. Mosquito nets treated with synthetic pyrethroids, which would give complete protection to users, are also in the final stages of experimentation.

Such breakthroughs in malaria research hold out hope for controlling the disease which causes almost a million deaths in the world each year. Artemisinine, made from a traditional Chinese herb, artemisia annua, has been in use in China since the early '80s and has resulted in a sharp decline in cerebral malaria cases even in those which were resistant to chloroquine.

According to a Chinese expert, Dr. Chi Ping Qiu, who was in Delhi to attend the malaria inter-regional meeting for Asia and the Western Pacific organised by the WHO, malaria used to be major health problem in China, particularly South China until the drug was introduced. As in India, falciparum (cerebral) malaria parasites had become resistant to commonly-used medicines.

The Indian Government has imported the seeds of the herb from China and has been growing it in Kashmir, according to Dr. V.P. Sharma, Director of the Malaria Research Centre. The alkaloids have been extracted and trials with monkeys have been completed. Phases 1 and 2A of trials on human volunteers have also been completed by the Central Drug Research Institute in Lucknow and Phase 2B is to be taken up soon.

"The drug will became available for treatment shortly, hopefully within two or three years", Dr. Sharma says. "It is a wonderful medicine for drug-resistant malaria and it also takes mosquitoes a very long time to develop resistance to it." Cerebral malaria has been causing serious concern in the country as the mosquitoes which carry this disease have become resistant to DDT and BHC (the two widely used insecticides) and the parasite has become immune to common anti-malaria drugs. In fact, despite the country's malaria control programme, the number of cases has gone up.

Artemisinine was used by village people in China since centuries but research on the herb began in the 1960s. Later, ways were found to extract alkaloids from the herb and now three derivatives have been developed of which one — artesunate — is water soluble and can be used as first-aid in cases of severe cerebral malaria, says Dr. Qiu.

It is also now available in powder form. Dr. Qiu has been conducting research in malaria for the past 14 years at the National Institute of Parasitic Diseases in Shanghai. The herbal drug would come in very useful in tribal areas in India, where cerebral malaria is rampant. As many as 54 million trials living in malaria endemic areas are estimated to be at risk. Nearly 30 per cent of the total malaria cases in India are from among tribals. As for cerebral malaria, which can be fatal, nearly 60 per cent of such cases are in the tribal regions. Of the 340 confirmed cerebral malaria deaths in 1990, a majority were tribals, according to Dr. M.V.V.L. Narasimhan, Director of the National Malaria Eradication Programme.

However, Dr. Sharma stressed that India would not depend on the Chinese herbal drug to treat cerebral malaria. Quinine is available and effective in drug-resistant malaria and iis used for serious and complicated cases which do not respond to commonly-used anti-malarials, he said. As for insecticide-impregnated mosquito nets, four years of research have yielded very encouraging results. Bednets treated with synthetic pyrethroids have been found to be effective for eight months, giving full protection to users even if the nets have holes or are not tucked in properly.

They are not expensive either. According to Dr. Sharma, an ordinary bednet costs about Rs. 60 and treating it would cost only an additional Rs. 5. Housewives can dip the bednets in the insecticide at home. (*Indian Express*)

VACCINE MAY HELP STOP SPREAD OF MALARIA

A lead for a vaccine to prevent the spread of malaria in the Third World countries has been developed by workers at the National Institute of Allergy & Infectious diseases, Bethesda, Md. (*Science* 252: 1310 (1991). The vaccine would not immunize the human host against the malaria organism but, rather might block transmission from malaria infected hosts to the mosquito vector. D.C. Kaslow & coworkers report that they inserted into attenuated vaccine virus, the gene for Pfs 25, a protein that appears on surfaces of plasmodium faliparum (a species of the malaria parasite) at a stage in its life cycle when it is ingested by the mosquito. They inoculated mice of varying genetic makeups with the virus. Three inoculations were needed to prevent transmission to mosquitoes. This may be because the attenuated virus may not proliferate in mice enough to express much Pfs 25 & produce sufficient antibody titers. *(C& EN*, June 3, 1991).

GENETICALLY ENGINEERED PLANTS RESIST FUNGI

A field trial has yielded successful results with tobacco plants genetically

engineered to produce a high level of the antifungal enzyme chitinase, according to DNA Plant Technology Corpn. (DNAP). The company says that in 3 tests, the plants, without chemical fungicides, resisted fungal infections at a level equal to that of plants that were treated with a chemical fungicide. Chitinase, which breaksdown chitin, a structural component of the cell walls of fungi, is produced naturally by certain plants and bacteria as a self-defense mechanism. DNAP scientists engineered the plants to express higher levels of chitinase by incorporating a gene isolated from a strain of *Serratia marcescens* bacteria. Tobacco was used as a model system. The company is now preparing to conduct tests with tomato plants modified to produce chitinase. DNAP scientists have also successfully introduced the gene and expressed chitinase in potatoes, lettuce, and sugarbeets.

SHOT IN THE ARM FOR MALARIA

Isn't it possible to develop a malarial vaccine that will also ensure safe anti-relapse therapy? That is the question that is now being tackled by the Central Drug Research Institute, at Lucknow. In a three year research project, the Institute is investigating the role of interferons in controlling malaria, under the tutelage of Director B.N. Dhawan.

Given that interferon and other lymphokines — natural anti-viral proteins which can be cultured in a laboratory — have now been recognised as effectual defences against infections, CDRI is exploring the possibilities for fighting malaria. If successful, the CDRI could end up developing a powerful weapon to eliminate the protozol infection and might even hit upon an alternative to the currently used anti-relapse drug which is toxic. Using interferons will also be safer and cheaper. Funded with the aid of a Rs. 82.44 lakh grant from the US National Institute of Health, the project also includes technology and expertise transfer from the US Uniformed Services University of Health Sciences' laboratories in Maryland. (*The Economics Times*, 14, September, 1991).

AUTO-IMMUNE SUPRESSANTS: A BOOST TO SURGICAL TRANSPLANTS

While walking through one of the wildest areas of northern Norway, a naturalist, who was a researcher at the Sandoz Laboratories, brought back a handful of earth which had appeared curious to him. Analysis revealed the presence of a tiny fungus, tolypocaladium inflatum, which was determined to have very weak antibiotic properties of no utility. However, J.F. Borel persisted, carried on working on it and, in 1974, published an article in which he presented the immuno-suppressive properties of the product obtained, named Cyclosporin. It took a further four years to purifyy it and begin thereapeutic tests (1978). The product then rapidly grew in importance.

At that time, grafts and organ transplants had brought in an era of a new form of surgery. But there were numerous failures, the survival of patients was very uncertain and the conditions of that survival were often so difficult that surgeons were becoming more and more reticent. Some of them had even given up practising this kind of surgery.

The surgical technique was then already well developed but the problem lay in the acceptance of the graft by the receiver, in other words, in the phenomenon of rejection. At that time, science was at its early beginnings in immunology, that powerful barrier set up by the body against any substance foreign to our organism, which it would eliminate with a powerful reaction. This system of defence thus had to (and still has to) be made powerless, first of all immediately after the operation and then for as long as the receiver showed any signs of rejection. The drawback here is that he would be defenceless against any and all attacks, throughout this entire period.

The earliest immuno-suppressants were difficult to handle and dangerous. Cyclosporin gave a new boost to transplant surgery and fresh hope to more than 100,000 patients. However, everything is not perfect, as it is not free from side-effects, and doctors have to be able to steer between two threats: an inadequate dose and a risk of rejection, or an overdose and the risk of irreversible kidney damage. But, for all that, cyclosporin remains one of the major therapeutic discoveries of this century. One of the most promising research areas in immunology is the aspect known as "auto-immune" diseases. There were numerous ailments for whose mechanism there was no explanation and therefore, very often, no valid treatment was given. This carried on until the hypothesis was put forward that, often, in very imprecise conditions, the organism started to build antibodies against a particular group of cells or one of the organs of which it was composed. Scientists had the idea of using immunosuppressive treatment against this self-destruction.

Research on auto-immune diseases and their treatment by cyclosporin includes: Diabetes: France is in the forefront here. Cyclosporin has been used for five years in seven hospitals under the leadership of Prof. J.F. Bach (Immuno-pathological Research Unit at Necker Hospital in Paris) either by itself or with monoclonal antibodies aimed at the lymphocytes attacking the pancreas cells. It appears that early treatment could stem the process of the destructive immunity attack and lead to a real cure for diabetes.

Rheumatoid polyarthritis: there are 600,000 people suffering from this disease in France and millions throughout the world. This disease entails the slow, unrelenting, disabling and painful destruction of the bone cartilage in the joints by T4 lymphocytes which release

interleukins. But there is difference in indications between Canadian studies and French studies about the amount of cyclosporin to be administered (influences of the climate, living conditions, diet, etc.). A multicentre study, headed by Professor Dougados (from Paris), is thus to be undertaken in 22 French university-hospital centres.

Psoriasis: This skin disease, which is troublesome physically, but even more so psychologically, is characterised by a permanent flaking of the skin in the form of thin white scales. All kinds of hypothesis had been put forward, including that of a psychosomatic origin. But, for the patients, there had only been palliatives with little or no effect, or treatment by light, with uncertain results. In 1985, a psoriasis patient had to have a transplant for serious kidney failure. He therefore undertook treatment with immuno-suppressants and, to everyone's surprise, his psoriasis disappeared completely. It is, of course, not possible to treat all of the 200,000 French people suffering from psoriasis with cyclosporin, owing to the secondary effect, the price and the necessity for continuous medical supervision. But a group of 200 patients has been studied for three years by Professor Dubertet's team at the Saint Louis Hospital in Paris and the treatment has proved remarkably effective; changing the lives of the patients completely. Here too, the interleukins produced by the T4 lymphocytes seem to be the cause.

OLD DRUG, NEW CURE

It may have failed to stop advancing cancer cells but is certainly stopping diabetes in its tracks. A drug, developed 30 years ago as an anti-cancer medicine, could well hold out hopes for the diabetes-afflicted. Azathioprine, sold under the brand name of Imuran had not been a striking success in killing cancer cells. So the good doctors put it to use for preventing organ transplant rejection and curing rheumatoid arthritis.

Recently, however, some researchers in Florida had a bright idea. They reasoned that it was logical to use the drug to prevent the auto-immune system from going haywire. And since diabetes was caused by the auto-immune system attacking the body's own insulin producing cells, they figured that could well nip diabetes at the bud. They tried their treatment on Peggy Polopulus of New York who was showing signs of incipient diabetes — her blood sugar levels had started falling. The results were certainly gratifying. And now they plan to go in for large-scale testing on other patients. *(The Economic Times*, 26, Oct. 91).

COPYCAT SOLUTIONS

Reverse engineering has always been useful — as any Japanese manufacturer will tell you. But so far it was confined to manufacturing. Now, British scientists are using the technique to find remedies for human illnesses. A research project in the Kent University is attempting to identify body proteins that affect the spread of diseases, and then using genetic engineering to produce them in quantity for experiments that could lead to more effective medicines. The theory is sound. The researchers are attempting to isolate the genes which encode the body proteins and determine exactly what confers them with the unique characteristics. Four areas are being studied: heart ailments, inflammation, chronic joint problems and viral infections. The idea may not be strictly original but if they do achieve success, no one will be complaining — least of all the sufferers of these diseases. *(The Economic Times*, 7, Dec., 91).

A NEW COMBINATION TO TREAT A DEADLY AFFLICTION

Recently, American scientists claim to have found a way to quell the most fatal afflication striking AIDS patients: a pneumonia called PCP. Clinical trials have shown that a daily dose of double-strength tablet of the antibiotic TMP/SMY was 3.25 times more effective in preventing the recurrence of pneumonia, than the prescribed 300 mg of aerosolised pentamidine, which is the only drug approved for treating pneumonia. Of course, both sets of patients were already medicated with the AIDS drug, AZT or Zidovudine.

Out of the 310 AIDS patients under observation, only 50 showed recurrence of PCP —14 of these took TMP/SMX and 35 were on aerosolised pentamidine. The real benefit of the exercise will be to the wallet. TMP/SMX is a much more common and inexpensive option and could save AIDS patients upto $3000 a year in medication. *(The Economic Times*, 21, Sept., 91).

CURING A SYNDROME

Chronic fatigue syndrome sufferers, till recently, were considered to be psychiatric patients. Now, however, medical profession has started believing that the symptoms are actually caused by a virus or other physiological agents. The transition could prove invaluable in finding a quick cure to the problem. Researchers are tracking at least four different viruses. The Wistar Institute in Philadelphia is investigating an unidentified retrovirus similar to HTLV-2; the University of Southern California, Los Angeles. is pursuing a spumavirus, retrovirus known as human foamy virus; the University of Glasgow, Scotland, is focusing on enteroviruses that include the polio virus; and the Harvard University feels its human herpes virus could be responsible for the symtoms.

Most of these viruses already reside in humans, but remain latent due to the body's immunity system. Recent research, however, has shown that sufferes of the syndrome could actually be debilitated by these viruses; the immunity system is weakened due to chronic fatigue and that activates the dormant invaders.*(The Economic Times*, 5 Octber 1991)

DIALYSIS ANYWHERE

Trials are about to start with prototypes of an innovative system of dialysis that offers kidney failure sufferers more convenience, independence and mobility, plus a reduced risk of infection. Continuous ambulatory peritoneal dialysis, or CAPD, was produced in the 1980's as a means of treating increased numbers of kidney failure patients and those for which no haemodialysis machine was available. CAPD avoids the need to travel to a hospital renal unit to spend up to five hours, three times a week, attached to such machines, by removing harmful substances such as urea from the blood through a simple process of diffusion.

With CAPD, a catheter is inserted into the abdomen to allow dialysis fluid from prepacked special plastic bags to pass directly into the peritoneal cavity. Waste products present in the blood then diffuse across the peritoneal membrane and after a period of time the dialysate is drained out of the body via the same catheter into the empty bag. This 30-minute treatment has to be carried out three or four times a day

Although this form of dialysis has proved very successful, doctors have found there are problems of infection via the external catheter, while the bladder can cease to function because it is not being used. But now, the British Technology Group (BTG) is backing a wholly implantable CAPD system that will minimise the problems of the present form of such dialysis.

Developed by consultant surgeon Dr. Paul O'Byrne, the new system involves the permanent insertion of a catheter and pump underneath the skin. The catheter drains into the peritoneal cavity, and the pump, which is operated manually and connected to tubing at either end, accesses the peritoneal cavity, allowing waste fluid to be shunted to the exit point in the bladder, from where it is excreted in the normal way. A BTG spokesman explained: "As the whole process occurs inside the body, there is no permanent contact with the outside environment, and so the risk of infection is significantly reduced.

Providing simple hygiene rules are followed, dialysis can be take place anywhere — at home, travelling abroad or even outdoors. Perhaps more importantly, this system allows the bladder to retain its normal function and as such does not pose a great problem should the option of such a transplant become available". Following completion of trials with the new system, BTG will seek licences to commercialise it. (*Spectrum)*

RESEARCH INTO JUVENILE CEREBRAL PALSY

A seven-year-old boy with cerebral palsy, seen at the Department of Orthopaedic Surgery, Queen's University, Belfast, Northern Ireland, wearing equipment that measures the amount of air breathed in and out through the face mask. The exhaled air is sampled and the concentration of oxygen measured by the small pack on his chest. This information is transmitted by a radio signal to the hand-held recorder every 15 seconds, leaving the child unencumbered by any trailing leads and allowing him free mobility. He is much less efficient in walking than a normal child of his age and often uses between two or three times the amount of oxygen to walk a given distance.

This method, which has been used in training programmes to help athletes improve their efficiency, is now being used in Belfast to evaluate the needs of children with locomotor problems. It helps to determine the most suitable walking aid for an individual child, and to measure the effects of various treatments on their walking efficiency.

The system is being used to evaluate the effects of a new therapy for cerebral palsy. In this condition, which is the result of damage to the developing brain, there is frequently an abnormality of muscle tone leaving muscles overactive and spastic. In an attempt to reduce this, very small doses of Botulinum A toxin is injected into the overactive muscles, blocking the signals from nerve to muscles. Further research is being carried out to evaluate the technique. (*Spectrum)*

NATURE'S WAY OF HANDLING STRESS

A team from the UK Medical Research Council's brain metabolism unit in Edinburgh, Scotland, has produced conclusive evidence that the human body is able to produce a heart hormone to help it control stress. One of the two major responses by the body to stress is the release of adrenocorticotrophin (ACTH) from the pituitary gland.

ACTH in turn stimulates the release of steroid hormones, which affect the metabolism of glucose and the body's response to infection and trauma, from the adrenal gland. Previous evidence has suggested that the ACTH release was not only stimulated but also inhibited by the brain.

And now, the Edinburgh team, using the powerful technique of immunoneutralisation, has shown that it is the heart hormone, arterial natriuretic peptide (ANP), that has a strong influence in preventing the body's potentially harmful overreaction, of some of its systems, to stress. The scientists found that ANP is not only produced in large quantities by the heart and involved in regulating the body's water and salt content, but is also synthesised by nerve cells present in the brain.

Prof. George Fink, director of the Edinburgh unit and team leader, commented: "Whether brain-derived ANP acts mainly as a steady brake on ACTH release, or plays the role of a signalling

peptide in stress and glucocorticoid negative feedback of ACTH release, remains to be determined. "Whatever the precise function of ANP, the fact that this heart hormone plays a major role in the neural system which controls the endocrine response to stress has important physiological and possibly clinical importance". The discovery could lead to the development of new types of drugs able to use nature's way of handling stress. (*Spectrum*)

BIOMAGNETISM AND ELECTRICAL PHENOMENA IN THE BODY

The medical practitioner, who over the past 20 years has had an increasing number of aids at his disposal, could soon have yet another: the SQUID neuromagnetometer for detecting biomagnetic sources in the brain.

The basic principle is that activity in the body generates tiny amounts of magnetic currents as well as electrical potentials. The detection of these tells us about the functional state of the body, or in this case, the brain. For many years the electrical potentials generated by the brain have been used for both EEGs (electroencephalograms) and evoked responses.

However, electrical signals are smeared by the intervening tissue and only represent the potentials around the neurous. Magnetic currents, however, are unsmeared and represent activity within the neurons themselves.

Here, at Aston University in Birmingham in the English Midlands, scientists are using a SQUID (Super-conducting quantum interference device) to build up a map of biomagnetic currents at separate locations at the back of the skull.

The magnetic currents represent the brain's responses to flashes of light or changing patterns and it is hoped that these new techniques will allow better location of abnormalities and may be more sensitive to conditions such as the Alzheimer's disease. (*Spectrum*)

CURING GENETIC DISORDERS

The modification of human genes offers, for the first time, the prospect of an effective treatment and cure of many genetic disorders, says a new UK report on the ethics of gene therapy. This is the view of a special committee set up by the UK Government in 1989, which has just produced five main recommendations designed to allay public fears that gene manipulation could sometimes lead to a "Frankenstein monster".

The committee, however, says that before gene therapy is introduced into medical practice, it must be ethically acceptable and shown it must be so. Committee members believe such therapy raises no new ethical principle, but because it is so new, it should initially be regarded as research and subjected to the existing rules for a research involving humans.

When gene therapy is used, experts believe it should be restricted to the alleviation of genetic disease in individual patients and should not be used to change or enhance normal human traits. Calling for a new expert supervisory body to provide scientific and medical advice on matters involved in the safety and efficacy of human gene modification, and its use, the Government committee says genetic modification of reproductive cells, or the germ cells which give rise to them, should not at present be attempted.

The report explains: "Genes are the essence of life; they carry the coded messages that are stored in every living cell, telling it how to function and multiply, and when to do so. Until recently, a genetic message could be altered only by accident or chance. Now, human ingenuity makes it possible to

manipulate these messages deliberately and with increasing precision. Such manipulations might thus yield significant benefits, especially if they can be appllied to the prevention or relief of diseases which have a genetic cause. But they might have unwanted effects. They might, for example, cause harmful or otherwise unacceptable geneetic alterations or mutations or even lead to social abuses''.

The committee says it is not merely a fear of the unknown that engenders caution, but also a recognition that the ability to modify the genetic endowment of human beings provides opportunities to influence life and health more fundamentally than could any available treatment. (*Spectrum*)

UNDERSTANDING AIDS

Human immunodeficiency virus (HIV) causes the fatal disease AIDS. At present, as there is no cure and no vaccine, education and public health measures are the only routes to preventing the spread of this disease. In many situations these latter measures may be woefully inadequate and there is currently a major international research effort aimed at understanding the biology of the virus and the nature of the disease.

Drs. Alan and Sue Kingsman of Oxford University's Biochemistry Department believe that by analysing the functions of each individual HIV gene it will be possible to determine how the virus exploits human cells for its own multiplication. To this end they are using genetic engineering techniques to define the key functions of the HIV proteins.

They are then attempting to discover which of the many proteins inside a human cell act as targets for the viral proteins. At present scientists have little idea of how these proteins function, except that their behaviour is unlike any other genetic switch that has been analysed to date. However, both of these proteins interact with normal cellular proteins.

The Kingsmans believe that the human cell contains an as yet uncharacterised pathway for handling ribonucleic acids (the intermediate messenger between the gene and the protein), and that the HIV proteins hijack this pathway to allow efficient production of a new virus.

Understanding AIDS will therefore require greater understanding of the human cell itself. This dissection of the functions of HIV proteins is a long term research project but in the end, scientists hope that the knowledge will allow a rational approach to the design of therapies and diagnostics reagents that will help to combat AIDS. (*Spectrum*)

Science Briefs

EFFECTIVE USE OF POLYETHYLENE WASTE

A new process to reuse polyethylene waste by cracking it into oil has been developed by Japan's Agency of Industrial Science and Technology industrial research institute at Hokkaido, reports the journal *Techno Japan*.

The new process is a two-stage catalytic process, using natural zeolite as the catalyst, producing higher-quality gas oil than the conventional process which depends on thermal cracking only, without being accompanied by carbon deposition.

Waste from various types of plastics such as polyethylene exhaust from homes and factories are at present mostly disposed of by burying. However, it is becoming increasingly difficult to find good disposal sites as the volumes of the wastes continue to rise. This situation has prompted a search for techniques to thermally crack plastic materials.

The processes developed so far produce only waxlike oil of offensive odour. In addition, they produce large quantities of carbon as a byproduct which is deposited on reactor walls.

The new process tries to crack polyethylene as one of the representative plastic materials, to produce higher-quality fuel oil. Unlike the conventional process that depends on thermal cracking, it thermally treats polyethylene in two stages in tanks packed with catalyst of natural zeolite.

The first and second tanks operate at 450 degrees celsius to produce 4.8 kg per hour of transparent, high quality oil without carbon deposition. The researchers plan further work to commerialise the process, the journal said.

P.T.I. Science Service,
April 16-30, 1992, p. 11

DECOMPOSABLE PLASTIC FROM FOOD WASTES

A process that converts starchy food wastes and byproducts into a lactic acid-based plastic that fully decomposes into harmless chemicals when exposed to moisture of sunlight might be commercially available soon, according to a report in the journal *Chemical and Engineering News*.

Argonne National Laboratory in the United States has licensed key steps in its BioLac process to Kyowa Hakko USA Inc., the subsidiary of Japan's Kyowa Hakko, which deals with fermentation products. Kyowa Hakko plans to carry out further research aimed at commercialisation, the journal has quoted director of marketing Harry Karei as saying. The BioLac plastic has potential applications for products such as compost bags, coatings for paper, seeds, pesticides and fertilisers.

It could also find use in mulch films for timely release of pesticides and fertilisers. In the two steps that have been licensed, one converts glucose, found in starchy food wastes, into lactic acid, the other converts lactic acid into polylactic acid.

P.T.I. Science Service,
April 16-30, 1992, p. 11

SPACE-AGE TECHNOLOGY FOR THE AILING HEART

Space-age technology developed at Ulster University in Northern Ireland is claimed to have achieved a major advance in the treatment of patients suffering from heart illnesses, reports *London Press Service*.

An entire new technique for treating a suspected heart attack victim involves the use of a paper-thin plastic sheet containing 64 electrodes. This is stuck to the patient's chest and eliminates the traditional need to individually attach a large number of electrodes. The plastic sheet of electrodes, a product of the Juno space programme in which the University was involved, is linked to a monitor and the information from the electrodes is displaed on a flat monitor screen and also printed out. The information produces what is likened to a relief map of the heart function and from this the doctor can assess the damage inflicted on the heart and gauge the effect of any clot busting drug being given.

The Ulster researchers have also developed the first on-the-spot means of pacing the ventricle, the main pumping chamber of the heart. This is achieved by inserting a long tube down the patient's throat close to the heart so that an electrical charge can be fed down it to regulate the heart beat. Professor John Anderson, who is leading the research says this radical advance in treatment means that heart attack patients can now receive immedite treatment without having to wait until they are in hospital under anaesthetic where the tradtional method has been to insert catheters.

All the information is stored on a memory card from which it can be studied in greater detail by consultants in hospital. It sounds like science fiction, but this will be part of the normal equipment carried by cardiac ambulances in the near future. Prof. Anderson first became interested in new technology for treating heart conditions when he worked with Prof. Frank Pantridge, who developed the first mobile defibrillator at Northern Ireland's Royal Victoria Hospital in the early 1970s.

He says while the portable defibrillator was a world first in the treatment following a heart attack, the new technology now allows doctors to accurately predict an imminent heart attack. It is already undergoing trials at the Royal Victoria Hospital and in some cardiac

ambulances. Production of the new equipment is expected to start in Northern Ireland towards the end of this year.

P.T.I. Science Service, April 16-30, 1992, p.13.

LASER MILLING MAKES LIGHT WORK OF MACHINING DIFFICULT MATERIALS

Researchers in the Netherlands have developed a patented laser milling technique than makes it possible to machine materials such as hardened tool steels, which are notoriously difficult to shape by mechanical methods.

The new technology, which has been developed by engineers at TNO's Centre for Materials Processing with Lasers, offers the prospect of more rapid and more accurate machining of complex forms, according to a *TNO newsletter*. Laser milling can be used on the vast majority of non-transparent materials including cemented carbides, ceramics, Ni and Co alloys, hardened steels and composites, all of which are difficult to process with conventional methods.

The new technique can also be used on non-conductive materials, which cannot be machined with electric discharge equipment. Laser milling is based on the principle that a fixed volume of material is evaported with each pulse of laser energy.

The process has a special advantage in that it is self-regulating; as material is removed and the spot size increases, the power density decreases — assuming a constant setting of the laser beam. Milling stops automatically once the power density falls below the energy threshold for the removal of material.

The Centre for Materials Processing with Lasers has been using the patented technique to apply fine patterns to surfaces of flat and round work piec Excellent results have been obtained these trials, with dimensional accurac of better than plus or minus 10 μm a surface finishes within 2 μm.

It is estimated that machining rates several cubic millimetres per minute perfectly feasible with the current ge eration of lasers. Moreover, even fas processing rates can be achieved using laser milling in conjunction w conventional machining methods. Th is particularly useful when machini large cavities notches or blind hole

In addition, the patented techniq can be employed for post-treatme purposes to enhance the surface fini of components. Research is curren continuing in this area to evaluate po sible aternatives.

P.T.I.Science Servi April 16-30, 1992, p.

PRODUCTION MANAGEMENT

Part XVIII — Duties and Responsibilities of Production Manager

N.R. PAI

RECRUITMENT AND STAFFING

Persons serving in an enterprise decide its fate as regards its success or failure. The very survival of an organisation depends upon the persons who serve it. The production manager himself is an employee but since he occupies a higher position in an organisational set up he is often given an important position on the interview panel and more so when selection of his own subordinates is concerned. This is for the simple reason that he is ultimately responsible for the work of the persons recruited directly under him or in his department.

Recruitment and staffing therefore becomes one of his important duties. The staffing can be considered under two cadres:

i) Officers and supervisory cadre
ii) Workers cadre

Staffing of officers and supervisory cadre

For interviewing candidates of this category personnel manager sits with his immediate boss, the works manager, personnel manager and later often with managing director or several interviews of the candidates can be conducted with all or some of these executives.

They look to the following points while interviewing candidates.

a) Ability of the candidate to get along with his subordinates and his peers.

Amicable and pleasant personality of a candidate is a positive point here.

Candidate should have an even temperament

He should have regards for others rights and aims in life

He has to rub shoulders with his fellowmen daily and therefore he should have manners and courtesy. This ensures harmonious working with his collegues and subordinates. Otherwise if there is a friction every now and then the personnel manager would be taxed often for non productive activity of settling such disputes.

b) Physical fitness:

(i) Preferably the candidate should not have any physical handicaps when he is taken up for a hard production task.

ii) The candidate should be healthy and strong physically also, apart from being mentally fit, so that when needed he can work beyond usual working hours. If needed, he should be able to work round the clock to fulfill the business commitments of an organisation. It happens at times that the person has to take a little rest (as it may happen during plant erection or plant commissioning) and then again join work. This situation can last for a week or so and the person should be able to withstand the accompanying mental strain and physical fatigue. Lately many firms have practice of carrying out psychological check up of a candidate (a psychiatrist or a psychoanalyst is often included on an interview panel) apart from having a regular medical check up.

c) Honesty, stability etc.

Honesty of a very high order is required to preserve a companys secrets. He should also stick on, on his job for a reasonable length of time. He should have full belief in fairplay, and should be courageous, so that he can rise to the occasion and face the situation at times of difficulties.

d) Disciplinary attitute towards working and obedience

Whenever he differs with his boss as regards the decision the boss has taken, he has to consider his personal views secondary and should follow whatever the boss says ultimately without any prejudice whatsoever. He may try to convince his superior about his own view point. But failing to convince should not bring down his attitude in not following boss' orders. Here his action like a soldier is generally expected from his superiors

e) Quick understanding, speedy analysis and correct judgement of the sitution

Whatever situation arises on the plant he should grasp it quickly. He should know the pulse of his subordinates and possibly their individual nature. He should then be capable of analysing the situation correctly to take appropriate decision which will solve the problem and will not complicate it.

f) Technical knowledge

He should have sound knowledge of his own subject and in his own field of working. This knowledge he might have gained during his educational career or it might have been obtained by him through practical experience in previous jobs. Such knowledge earns respect for him from his colleagues and subordinates which in turn results in a good coopertion by colleagues and accepting him as their boss in case of subordinates.

g) Ability to listen and to express

He should be a good listener. Again he should be able to express himself properly. Good expression helps in communication and in smoothening hard facts by choosing appropriate words.

h) Other important qualities

These include: leadership quallity, readiness to accept responsibility, willingness to improve and to lear with an open mind, mental alertness, ability to accept criticism and advice sportingly and work-minded nature and not leisure seeking attitude.

In fact, an employer looks for all these above mentioned qualities in any of his senior executives. That way any organisation is always a reflection of the mental frame of its chief executive. Hence while selecting his chief executive the employer sees that all these qualities or rather most of these qualities are present in him. Such an executive will subsequently select persons of his mental frame.

Staffing not easy

Staffing is not an easy task. It is much more difficult to interview a candidate than to appear for an interview. During interviews there is hardly half an hour or an hour at most, at one's disposal in which time one has to ascertain on the above requirements. To facilitate the process of selection and recruitment generally prescribed forms are supplied for filling up to the high ranking staff personnel. These forms are made very carefully. They are supposed to inform the interviewer with:

a) Candidates family background

This gives idea about, dependents, need to serve, family culture, responsibility he is shouldering in family (and hence what responsibility can be reposed on him) etc.

b) Financial status

This brings out his need to serve. If financially sound he may leave the job at any movement. He is then less worried about serving, in other words he does not need the job badly. Candidate is therefore likely to be more unstable in his job.

c) Educational qualifications

According to the educationist the chief purpose of education is to modify human behaviour. Apart from securing a degree education teaches to think in terms of other persons. Educated persons are supposed to have better manners and display finer aspects of courtesy which is so essential in today's world to smoothen man-to-man relation. Again they have a certain level of sharpened intellect, a better reasoning, a good analysing mind etc. etc. And the most important feature is that they are equipped with knowledge befitting their job responsibilities.

d) Industrial experience

Candidate's field of experience should be matching with job requirements. Industrial experience also indicates in what capacity and how long candidate has worked. One can also find out by proper interrogation what was his attitude towards the work assigned or entrusted to him. "Reason of leaving": what irritates him and whether similar situation can possibly arise in one's company. In that case he will be a misfit.

e) Leisure habits.

f) References: Whom he knows or rather who can vouch for him.

The persons interviewing the candidates often judge a candidate on the following basis:

a) Personality and physical diability: Spacious cabins are often employed for interviewing candidates. The candidte then has to work some distance before he reaches his chair. The way he walks, his gait, tells a lot to a psychoanalyst sitting on interview panel.

b) Mental alertness and power of expression: Smartness is judged here. How quickly he answers questions and that too in appropriate words or rather whether he uses well-chosen words to answer the querries, whereby exact meaning is carried to the listners.

c) Suitability of his qualifications from point of view of company's working.

d) Suitability of his experience from the angle of company's advantage.

e) Ability to apply knowledge: He may be knowledgeable, but then how far he has succeeded in its application to previous job/s. How far he has used his qualifications and previous experiences in his life to solve his problems there. This bring out his ability to apply his knowledge.

f) Leisure habits: This factor is used to ascertain how exactly candidate is inclined to use his free-time. It brings out his inherent nature, whether he spends his leisure time (i) creatively in reading books or in gardening etc., (ii) keeps himself physically active and fit and mentally refreshed by playing out door games; (iii) The worst is when he whiles away his precious time. Here psychologists believe that rest is nothing but a change of work.

g) Leadership qualities: Each one of these interviewers makes remarks on the intereview sheets which are all compiled together along with his own candidature sheet to make a full record. Study of these show whether he should be called for second interview or not.

Recruitment of workers:

Generally no candidature sheet is used here. They look into the following points.

a) Has he left or had he to leave his previous job because of his trade union activity. This has to to be confirmed by

some person who is already working in the company and who is also in good books of the management.

b. Physical fitness

c. His ability to work without friction. His nature should not be quarrelsome.

d. Willingness to accept inevitable hazards of plant working.

e. His honesty and his obedience. His disciplinary attitute towards the work entrusted to him.

f. The field of his previous experience if any.

TRAINING

This is one more responsibility of production manager. The recruited persons are often fresh or if experienced, they may not be experienced in the same field of production the company in question is carrying out. Often the persons are therefore taken up on a training basis before even placing them on probation.

SURPRISE CHECK UP

This is one more duty of production manager. It is necessary for smooth running of production especially in night shifts which are running in the physical absence of top boss who come in general shift.

PROCESS IMPROVEMENT

After looking back and studying old batch sheets, process can be changed to the conditions attained in the batch sheet wherein the best results were obtained quality wise, quantity wise and or timewise.

Some important qualities required to be a successful production manager

In the foregoing discussion we have already brought forth some of the qualities of production manager, some more important ones will be considered here below:

Emotional stability

Executive must have emotional stability. Happenings on the plant should not reflect on his face. Effects of any action by any one working with him should not be visible or readable on his face. His face should not betray him e.g. He might have got disturbed by resignation of his hard working subordinate. However, his feelings should not be reflected on his face. Otherwise his weakness gets exposed and it can also indicate which actions distrub you or irritate you. One's opponent can then exploit the situation.

Use of power only when it is a "must"

He should know that authority delegated to him should be used only when it is a "must". A good execuive is one who makes minimum use of his powers, because it is said "power lies in not using the power" (or using it rarely when it is a must) Again, show of force is more effective than the actual use of force. It is the fear of force which works better on human psychology. Executive should make use of this part of human mind.

Again whenever an executive takes an action against his subordinates it should be such that an example is set for the rest of his juniors. This gives far reaching effects of his action.

Power of convincing and power of persuation

It is an important quality an executive should have to carry masses with him. This quality forms an important aspect of leadership ability. They are not discouraged in the least however much you may argue against their points. They can persuade you to convince you of their ideas.

Objective approach

To keep the spirit behind the rule and not only the outershell of the rule

He has to see that spirit behind any factory rule is kept up and there is no mere following of the rule blindly. For this he may have to deviate from the rules whenever needed. Rules are meant for smooth running of the factory. They are framed with this spirit. To keep up their spirit by some deviation production manager is often given a "free hand" atleast to some extent.

Knack to ascertain abilities of his subordinates

The production manager should know which person is suited. He should be excellent at choosing persons. This lessens his burden of day-to-day working once he selects right man at right place.

Intellectual Property Protection in India

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1. What is meant by Intellectual property?

Any property, moveable or immoveable has to be protected in order to prevent it from being stolen. Similarly, the rights in the property resulting from the intellectual efforts of an individual need also to be protected to prevent it from infringement. The results of such efforts is now come to be known as Intellectual Property. Patents for inventions, Designs for industrial designs and Trade Marks for marketing a product are collectively known as Industrial Property. These three species of industrial property along with copyright in literary work form Intellectual Property.

2. How is Intellectual property protected?

The rights in the intellectual property is protected by the appropriate legislations of the country.

3. What is the position of protection of intellectual property in India?

In India, the protection of intellectual property is governed by the following legislations.

Inventions by the Patent Act, 1970.
Designs by the Designs Act, 1911.
Trade Marks by the Trade & Merchandise Marks Act, 1958.
Copyright by the copyright Act, 1958 as amended in 1983 & 1984.

PATENTS

4. What is a Patent?

A Patent is a legally protected property right to one form of intangible "intellectual property"; namely inventions. A patent right confers on its holder the exclusive right in the invention for a limited period.

Patent rights are granted by the State to an applicant as per the applicable law of that State in consideration of the disclosure of an invention. The rights in a patent can be enforced in the country which grants the patent and not valid in other countries.

5. What is the basic purpose of granting patents?

The basic purpose of granting patents is to encourage inventive activity. In totality this system is formulated and revised from time to time in the context of political, economic and industrial situation of a nation so as to further the interests of the State.

6. Who is a Patentee?

A patentee is the person for the time being entered in the Register of Patents maintained at the Patent Office and is the grantee or proprietor (by assignment) of the patent.

7. Who is responsible for the administration of the Patents Act 70?

To administer the provisions of the Patents Act, 1970 and Patents Rule, 1972 the Patent Office has been established having its head quarters at Calcutta and its branches at Delhi, Bombay and Madras. The Patent Office is statutorily under the charge of the Controller General of Patents, Designs and Trade Marks under the superintendance and control of the Department of Industrial Development, Ministry of Industry, Government of India.

8. What are the rights of a patentee?

In India, by the grant of a Patent under the Act the following exclusive rights are conferred on the Patentee:

(i) where the patent granted is for an article or substance, the exclusive right by himself, his agents, or licencees to make use, exercise, sell or distribute such article or substance in India.

(ii) where the patent granted is for a method or process of manufacture of an article or substance, the exclusive right for himself, his agents or licencees to use or exercise the method or process in India.

This means where a patent is for a method or a process of manufacturing an article or substance, confers on the patentee an exclusive right to use the method or process in India. In other words, such a patent does not confer any right to the resultant product.

9. What are the obligations of a Patentee?

While exercising the above said rights, the patentee has also an obligation that the invention covered in the patent is worked in India on a commercial scale and to the fullest extent that is reasonably practicable without undue delay and the patented articles are available to the public at reasonable terms.

10. Are the patents granted under the Patents Act, 70 subject to any conditions?

Patents granted under the Patents Act, 70 are subject to the condition that the invention can be used by the Government of India by import or manufacture for purposes of its own use and its use for experimental research or educational purposes. Furthermore, an invention falling within the definition of drug or food forming the subject matter of a patent can be imported by Government for its own use or distribution in any dispensary or hospital for public service. Such use or import does not constitute infringement of the patentee's rights but any commercial use of such inventions will constitute an infringement.

11. What constitutes an invention?

No general rule can be laid down as to what constitutes an invention. The mere collocation of two or more things without exercise of inventive ingenuity is not a subject matter for a patent. It is an invention if the process of manufacturing an article requires some ingenuity or inventive step. Simplicity is not necessarily an objection for securing a patent for an invention. The means whereby the object is attained may be perfectly simple and perfectly common, yet there may be an invention if the inventor has developed a variant which will render more useful results as disclosed. It is immaterial whether the invention comes into existence by accident, but there must be some inventive step.

12. What inventions are patentable under the Patents Act, 70?

"Invention" has been defined in section 2(1) (j) of the Act. Under the said provision patentable inventions as applied to a process, method, art or manner of manufacture should be regarded as an artificial process or operation of an industrial nature wherein certain starting materials have been subjected to the process or operation to convert the starting material in such manner to produce a new and useful article or a substance which is tangible. If the starting material remains unaltered by the process and said product also remains the same as the starting material, then, the process cannot be called as a manufacture for the purpose of patentability.

It is to be noted that the definition of invention also includes any new and useful improvement of any manner of manufacture, article or substance whether patented or not. Such improvement in order to be patentable must satisfy the other requirements of the definition of invention.

13. What are inventions not patentable under the Patents Act, 70?

Not all the inventions are patentable even though they satisfy the requirements of the definition of invention under the Act. In order to remove any doubts, Section 3 has been incorporated in the Act, wherein inventions which are not patentable have been specified. It is to be noted that the inventions specified in Section 3 of the Act are those which in general, are universally not patentable.

14. How is the novelty of an invention determined?

The novelty of an invention is judged taking into consideration the knowledge available in India and elsewhere in the field at the time of filing the application for patent. In other words, the invention should not be known anywhere in the world prior to the making of the application for patent.

15. Can one publish the invention before making an application for patent for the said invention?

No. Publication of the invention in India or elsewhere even by the inventor himself prior to the filling of an application for patent (except under certain rare circumstances) would bar subsequent patenting of the invention. Hence inventors should not disclose the invention before filing an application for patent. However, there can be no bar for secret working of the invention or to the disclosure of the invention to others confidentially under a secrecy agreement.

16. What is a Patent Specification?

The document in which the invention is disclosed is known as patent specification. A Patent Specification is a scientific cum legal document susceptible to interpretation by Courts of Law. It is, therefore, important that the disclosure to be made in the document is diligently made.

17. What are the different types of patent specification?

There are two types of Patent specifications provisional specification and complete specification.

A provisional specification discloses the nature of the invention and helps to establish the identity of the invention and to register the earliest authorship of an invention in the Patent Office, on first-cum-first-served basis. It is a document of record and no amendment by addition of new matter will be allowed. Although, a patent application accompanied with a provisional specification does not confer any legal patent rights to the applicants, it is, however, a very important document as it establishes the earliest ownership of an invention by inventors vis-a-vis later inventions on the same subject.

The description of the invention in a provisional specification need not be full and specific and it is sufficient if it

describes the nature of the invention. The reason is that the invention disclosed therein may still be in the conceptual stage or the application is being filed to register the priority of the said application considering the possible delay in filing the complete specification defining the full scope of the invention.

18. Is it required to file a complete specification in respect of an application filed accompanied by a provisional specification?

Where an application is filed accompanied with a provisional specification, a complete specification thereof should be filed within 12 months from the date of filing the application which may be extended by three months.

The provisional specification is not a rough draft of the complete specification. It does not contain any statement of claims defining the protection sought for. The complete specification which should follow the provisional specification does not replace the latter. Both are permanent and independent scientific cum legal documents.

19. When to file an application for patent?

An application for a patent should be filed at the earliest possible date. The filing of the application for patent accompanied with a provisional specification disclosing the essence of the nature of the invention helps to register the priority by the applicant and thus enables him to work the practical details of the invention which can be incorporated in the complete specification which is to be filed in respect of the said application.

20. Can the filing ot the application for patent be delayed until the invention is made commercially viable?

Filing of the application for patent should not be delayed until the invention is fully developed for commercial working. Delay in filing an application for patent involves risks such as: (i) other inventors might forestall the first inventor in applying for a patent for the said invention; (ii) there may be either an inadvertant publication of the invention by the inventor himself or the publication thereof by others independently of him.

21. Can a grant of a patent for an invention be prevented?

Though all steps are taken by the Controller during the examination of the documents filed in respect of an application for patent so as to remove any defects in the document, yet there may be some information regarding prior publication or use or other matters of vital importance which may be available to the people in research and trade and which might not be available in the records of the Patent Office and therefore, the Controller might not have considered such documents at the time of examination. By filing the opposition to the grant of Patent under Section 25 of the Act, the grant can either be refused or the scope of the protection claimed can be narrowed down by restricting the grant only to novel features of the invention.

Since the defective grant of a patent is definitely a source of unlawful hinderance to others in carrying out their legitimate activities, it is necessary to prevent such a grant. It is therefore important to be vigilant and to initiate proceedings for opposition to the grant of Patent on such application.

22. What is meant by the term of a patent?

The rights granted by a patent is not perpetual in nature. It is valid only for a particular period called term of the patent. In India the term of a patent falling within the category of food, drug or medicine is 5 years from the date of grant or 7 years from the date of filing which ever period is shorter and in respect of any other invention, it is 14 years from the date of the patent.

23. Can the transfer of rights in a Patent be effected?

Yes. There are two ways in which a patentee can exercise the rights accrued under a patent. They are (i) he can transfer (assignment) to another person the whole or part of his right in the patent to prevent others from making, using, excersing or selling the invention concerned in the said patent or (ii) he can deprive himself of the exclusive right to exercise those rights or part of them against particular persons (licensees).

24. Can a suit for infringement of the right conferred on a patent be instituted?

An action for infringement of a patent can be instituted by way of a suit in any court not inferior to a District court having jurisdiction to try the suit. Accordingly, the suit must be filed either before the District court or High court.

25. What are the reliefs admissible under an infringement suit?

The reliefs admissible are (i) an injunction; (ii) either damages or an account of profit. The grant of these reliefs is discretionary.

DESIGNS

26. What is the meaning of designs?

A design is an idea or conception as to features of shape,

configuration, pattern or ornament applied to an article; such designs form a special branch of industrial property.

27. Who is responsible for the administration of the Designs Act, 1911

The Designs Act, 1911 is administered by the Controller General of Patents, Designs & trade Marks, under the Control and supervision of the nodal Ministry, the Ministry of Industry, Department of Industrial Development, New Delhi.

28. Where the applications for the registration of designs have to be filed?

All applications for registration of designs or any proceedings in respect of the Act, and the Rules are to be made to the Controller of Patents at the Patent Office, 2nd M.S. Building, Nizam Palace, 234/4, Acharya Jagdish Bose Road, Calcutta 700 017.

29. When is registration of the design under the Designs Act, 1911 possible?

The registration of a design under the Act is possible only when it is reduced to visible form so as to be identifiable. It may be so reduced to the identifiable form either by its being embedded in the actual article or by its being placed upon a piece of paper in such a way that the shape or other features of the article to be made are clear to the eye.

In short, a design in order to be registrable under the Act nust consist either of a shape which is in three dimensions or of a pattern which is in two dimensions and that shape or pattern must be applied to an article or articles.

30. What are the rights of a registered proprietor of a design?

The rights accrued on the registration of Industrial Designs under the Act are distinct as compared to patent rights. The rights in patents are in respect of creations of technical art, whereas the rights in respect of designs are in the nature of aesthetic work and deal both with products of industrial and handicraft manufacture.

The "Copyright in a design" under the Act, confers on the registered proprietor the exclusive right to apply the design to any article in any class in which the design is registered.

31. Who can apply for the registration of a Design?

Any person claiming to be the proprietor of a design can file an application for the registration of a design. The term "person" includes an individual, firm, partnership and body corporate. In the case of partnership, the name(s) and address(es) of the partner/s should be given. In the case of an application filed under reciprocal arrangement, claiming priority, the application for registration of the design should be made by the person who has made the application for design in the country having reciprocal arrangement with India or his legal representative or assignee.

32. Is there any classification of goods for the purposes of registration?

For the purposes of registration of design under the Designs Act, 1911 goods to which the designs are to be applied are classified into different classes. The Fourth Schedule of the Rules, provides the different classes.

It is to be noted that registration of a design in one class enables the proprietor of the design to prevent others from applying the design to articles within that class only.

33. Is it essential to take registration in different classes?

If the article is capable of being made of materials included in different classes, it would be advisable to register the design in all the relevant classes. If any doubt arises as to the class to which any particular design of goods belong, it shall be determined by the Controller.

34. Can a design registered in one class be registered later in a different class?

A design registered in a class and capable of being registered in some other classes can be registered subsequentally in such other classes, provided that the duration of such subsequent registration is coterminous with original registration.

35. What is the period of the Copyright in Design?

The registration of a design under the Designs Act, 1911, confers upon the registered proprietor "copyright" in the design for a period of five years from the date of the registration. This period of registration can extended for further two periods of 5 years each on an application made to the Controller before the expiry of the first period or the subsequent period of the copyright. Such extensions can even be applied for as soon as the design is registered. The period of copyright in a design can, accordingly, be maintained for a total period of 15 years.

TRADE MARKS

36. What is the meaning of Trade Mark?

A trade mark is a visual symbol in the form of a word, a device, or a label applied to an article of manufacture or

commerce with a view to indicate to the purchasing members of public about the origin of the manufacture of goods affixed with that mark. It distinguishes such goods from the goods manufactured by others in the trade.

37. What is the importance of registration of a Trade Mark?

Registration of a mark is important because:

a) Trade Mark is a link between manufacturer and the customer
b) Trade Mark is an instrument of publicity
c) Trade Mark is a symbol of goodwill
d) Trade Mark is a property

38. Is registration of the Trade Mark essential?

No. A trader acquires a right of property in a distinguishable trade mark merely by using it upon or in connection with his goods irrespective of the extent of its use. For acquiring such right, it is not necessary that the said mark should have been used for a particular period of time.

A single actual use of the mark with intention to continue its use confers legal rights in a trade mark. This right is accrued under the common law rights.

But, registration of a trade mark under the Act provides better protection to the mark as the Certificate of Registration issued by the Registrar of Trade Mark will be prima facie evidence of the proprietor's title on the mark.

In the interests of manufacturers, it is, therefore, advisable to protect their proprietory rights in trade marks by registering them under the Act against the infringers of such rights, whenever, necessary.

As compared to the protection of inventions by patents where the publication of the invention prior to the making an application for patent would be a bar for patenting, in the case of a trade mark the established use of a mark prior to the making of an application for registration would be beneficial for registration.

39. What are the rights of a registered proprietor?

The registration of the Trade Mark under the Act confers on the proprietor of the mark, the exclusive rights to use the trade mark in relation to the goods covered by the registration. This right is excercisable in the case of marks registered under part A or Part B of the Register of Trade Marks.

40. Who can apply for Trade Mark registration?

Any person claiming to be the proprietor of a trade mark used or proposed to be used by him can make an application for the registration of the trade mark under the Act.

41. Have the Goods been classified for the purposes of registration under the Act?

For the purposes of the Act, Goods have been classified under 34 classes except the textile goods which are covered separately.

42. What is the duration of the registration of a trade mark?

Duration of a Trade Mark registered under the Act is for a period of 7 years from the date of filing of the application. This period may be renewed from time to time for a period of 7 years from the date of expiration of the original registration or subsequent renewal.

A Registered Trade Mark can be kept in force perpetually by paying the prescribed renewal fees within the prescribed period. This is because the continuous use of the mark over a long period helps in popularising the mark amongst the customers creating, thereby, publicity and goodwill amongst the customers.

43. Can an action be instituted for the infringement of the rights in a registered trade mark?

Yes. To institute an infringement proceeding, the proprietor of the Mark must prove that:

a) the mark used by the person is either identical with or deceptively similar to the registered trade mark.
b) the goods in respect of which it is used are specifically covered by the registration.
c) the use made of the mark is in the course of trade in areas covered by the registration.
d) the use is in such a manner as to render it likely to be taken as being use as trade mark.

44. What is meant by Passing Off Action?

The law of passing off is based on the principle that unfair competition is calculated to destroy honest business and should not be allowed. The object of the law is to restrain commercial piracy. The right in a common law trade mark is acquired by using it as a trade mark in connection with vendible products.

45. What are the reliefs which can be secured by the infringement or Passing off actions?

By way of relief, a court may grant for a successful plaintiff in an action for infringement or passing off:

a) an injunction restraining further use of the mark;

b) damages or an account of profits and
c) an order to delivery of the infringing labels and marks for destruction or erasure.

COPYRIGHT

46. What is Copyright?

Copyright is, basically, the right to copy and make use of literary, dramatic, musical, artistic works, cinematographic films, records and broadcast. Copyright is a proprietary right and comes into existence as soon as the work is created. The concept of copyright which earlier had its roots in the common law system, subsequently, came to be governed by national laws in each country.

47. Who is responsible for the administration of the Copyright Act, 1957 in India?

The Copyright Act 1957 is administered by the Registrar of Copyright, under the superintendance & control of the Department of Education, Ministry of Human Resource Development, Government of India, Shastri Bhawan, New Delhi.

48. Is registration of a copyright essential?

Registration of a work under the Copyright Act is not compulsory meaning thereby that there is no requirement of completion of any formality of registration or deposit in a National library etc. The advantages of copyright registration is that the particulars of a work once entered in the "Register of Copyrights" constitute prima facie evidence of ownership in the work.

49. Where is the copyright Office situated in India?

The Office of the Registrar of the Copyrights, is housed at Curzon Road Barracks, New Delhi 110 001.

It is to be noted that there are no branch offices of the Office of the Registrar of Copyrights.

50. What is a Copyright in a work?

Copyright in a work means the exclusive right to make certain uses of the work and depends upon the type of work.

51. What are known as Special Rights?

The author of a work has a moral right to claim authorship of his work and he or his legal heir can restrain or claim or hold damages in respect of any distortion, alteration or modification of the work which would be prejudicial to his honour or reputation.

52. What is the term of copyright Protection?

Original literary, dramatic, musical and artistic works enjoy Copyright protection for the life time of the author plus 50 years if they are published within the life time of the author. In the case of Copyright in cinematograph films, records, photographs, posthumous publications, annonymous and pseudonymous publications, works of Government and of international organisation, the term of protection is 50 years from the beginning of the calendar year next following the year in which the work was published. In the case of broadcasting authority or an organisation, the broadcasting Reproduction Right in respect of the programme broadcast by it, the life is for a period 25 years after the broadcast.

53. What is meant by Copyright Board?

The Act provides for the setting up of a Copyright Board. The Board is a quasi-judicial body established in September 1958 and has been functioning since then. The jurisdiction of the Board extends to whole of India.

54. Can a suit for an Infringement of Copyright be instituted?

The Act confers on the owner of the work a bundle of exclusive rights in respect of reproduction of the work and other acts and which enable the owner to get financial benefits by executing such rights. If any of these acts relating to the work is carried out by a person without a licence from the owner or a complaint is filed under the Act, it constitutes an infringement of the copyright in the work. Since exclusive rights granted under the Act extend to a translation or adaptation of the work and to substantial part thereof, the Copyright will be infringed if a substantial part of the work is reproduced.

(Paper presented at the Course-cum-Workshop on 'Drug Technology-Update' organised by the UDCT Alumni Association)

Radiation Curable Coatings: An Ecofriendly Coating Systems

SHREEKANT PATIL*

Background

The humankind is facing problem of pollution, since many years. Apart from all other chemical industries, paint and ink industry is contributing a lot of volatile waste to the atmosphere. The importance of saving energy became drastically apparent in the 1970s with the 'oil crisis'. Energy costs and availability suddenly became an important factor in the overall consideration of converting a liquid to a solid film to form a coating or ink. No sooner had the energy pressure started to reduce than the environmental pressures started to increase. That is why regulations to control hazardous substances are stringent to paint industries. The ecological requirement have been continuously forcing changes in the technologies of paints for industrial and domestic coatings. Technologists are finding new techniques to alleviate and overcome pollution with a view to improve the quality of life. Various legislations have been put forth for minimising pollution. This is applicable to both in the manufacturing and application fields, in order to develop new technology having minimal volatile organic compounds (VOC). The introduction of Rule 66 (adopted by Los Angeles country in 1966 to restrict the use of organic solvents) caused major changes in research priorities of the paints industry. In the area of environmental protection, the last quarter of a century has seen changes in the ink and coating industries which have been far greater than any in the preceding century. Natural products are being replaced by synthetic products mainly derived from petrochemicals. Diversified and sophisticated methods of applications have been developed and throughput speeds have substantially increased. There is always demand for new, safer technology. Economics of processing has got importance. The world is emerging with a force of conservation and care for environment, namely the green issue.

Considering the background of coating industry, four new types of coating systems have emerged. These are Powder, High Solids, Water-borne and Radiation curable coatings.

Radiation curing is a relatively new technology and has only found widespread commercial application over last 20 years. The ever increasing commercial pressure for efficiency and cost effectiveness has ensured the success of radiation curing due to its inherent advantages over conventionally cured coatings. Faster cure speed, reduced solvent/emission, lower energy consumption and space saving together with high quality product have lead to rapid growth in the application of radiation curing over the last decade in particular. There are four regions in the electromagnetic spectrum which may be used to achieve cure.

	Wavelength
(1) Microwave	10^6 - 10^9nm
(2) Infra-Red (IR)	10^3 - 10^6nm
(3) Ultra-Violet (UV)	200 - 400 nm
(4) X-rays	10^{-2} - 10 nm

Microwave and IR are low energy radiations used to increase molecular vibrations and therefore generate heat in solvent and aqueous based coatings such as paints to accelerate drying by evaporation. Relatively slow cure speed, solvent emissions and high residual heat combine to reduce the attractiveness of these systems. Microwave and IR will, of course, increase the speed of a chemical curing reaction by a simple increase in temperature. Use of X-rays radiation to initiate cure is not practical because of extensive safety pecautions necessary. Extensive shielding would be required. In addition the substrates are likely to be damaged by the high energy of X-rays.

U.V. and E.B. curing

Due to constant and rapid developing technologies, radiation curing systems, and especially those involving Ultra-Violet and Electron Beam are finding increasing application in the fields of printing inks, coatings and paints.

An UV curing ink or coating, contain a mixture cf liquid prepolymers, monomers, pigments and extenders, together with photoactive compounds (Photo Initiators). When UV light of suitable wavelength and intensity impinges upon and penetrates the coating, the photoinitiator is broken down into free radicals. The formed free radicals then initiate a rapid addition polymerisation reaction with the unsaturated group (usually acrylic) which are present in the prepolymers and monomers. Due to the multi-functional nature of the monomers, and prepolymers used, and chemical nature of the radical reactions involved (e.g. grafting), rapid conversion to a cross-linked, insoluble network takes place.

Unlike UV, electron beam is an ionising radiation. Accelerated electrons have a high electrical potential and since they carry much more energy than UV radiation, they are capable of initiating the chain polymerisation reaction without

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presence of an external initiator, thus creating a "purer" polymer. The chemical cross-linking reaction achieved through EB is very similar to that for UV.

UV curing depends on the passage of light to initiate cure, so that it is difficult to cure completely opaque films. Naturally, UV curing is better suited to clear, unpigmented coatings than it is to paint. On the contrary, EB curing relies on the penetration of electrons into a coating film, which is in turn, governed by their potential and the density of coating. Since EB curing does not require photoinitiators, coatings obtained will be "purer" with superior performance (e.g. colour stability and durability) than its UV counterpart. Problem of oxygen initiation occurs in UV curable acrylates. But UV equipment is less complicated, less expensive and much easier to commission than an EB accelerator. So EB cure is recommended for larger installations, with high volume throughput.

Advantages of Radiation Curable Coatings

1. Solvent free formulation, which eliminates problems associated with solvent emission.
2. Rapid cure at ambient temperatures.
3. Reduced energy consumption. UV consumes 1/5th and EB 1/100th only of the energy needed to cure solvent based inks and coatings.
4. Heat sensitive substrate can be coated.
5. Processes are readily automated for in line coatings and sequential operations can take place on the same lines.
6. Space savings. UV lamps and EB processes take up much less than thermal ovens.
7. Immediate stackability for finished products. (i.e. within 1-2 seconds of coatings and exposures).
8. Excellent film properties.

Radiation curable coatings systems are associated with certain disadvantages.

1. EB equipment is extremely expensive to install.
2. Very low viscosity coatings are often difficult to formulate, without resorting to hazardous monomers.
3. Radiation cure inks and coatings are apparently expensive when their costs are compared with a conventional system. However, allowance must be made for the 100% conversion of curable films against the 50% conversion for solvent system. It also be noted that the presence of photoinitators in UV systems makes them significantly more expensive than EB system.
4. The majority of acrylic monomers are skin irritants. There can be handling problems with radiation curing systems, due to their dermatitic and irritant nature.
5. Both UV and EB are most suited to flat surfaces, where the efficiency of the processes can be maximised.
6. UV may produce ozone and EB can produce X-rays.
7. Most radiation systems give inferior finishing properties on metal substrates.
8. Since radiations of wavelengths 254 nm severely effects eyes and skins, particular attention must be given to eye protection by using suitable goggles.
9. To avoid the build up of toxic ozone concentration, proper ventillation is needed.

Limitations of Radiation Cure Technology

Nevertheless, a new technology never replaces all others, because it always has limitations, some of which include:

1. High price of the binders. Actually this is not a limitation, because compared to price per Kg, the price per 100% dry material and more importantly the finished cost per square meter of substrate should be considered. Radiation cure technology, is in most cases, more economic than classical technologies.
2. In UV, pigmented coatings face difficulty in curing, but by using combination of curing mechanism, thickness of up to 150 gm/m² on wood can be satisfactorily cured.
3. In EB, the high investment in installation makes it economically viable for companies finishing several million square meters per year.
4. Acrylate binders are irritant and toxic type of monomers are being replaced by oxyethylated or propoxyethylated polyol polyacrylate without any problem.
5. Hidden parts cannot be cured, as a direct line of sight is required from the radiation source. Therefore, metallic substrates or big complicated metallic shapes, such as car bodies cannot be cured with UV and EB radiation.
6. Highly porous substrates are difficult to coat by UV cure.
7. Textile coatings are difficult to cure by UV or EB technology.
8. High EB doses (10 Mrads or more) can degrade some substrates, but most formulations cure under nitrogen with doses below 5 Mrads and often 3 Mrads is sufficient.
9. EB curing needs an inert atmosphere. Nevertheless, it is possible to cure in the presence of air, but higher doses are necessary and then the possible degradation of the substrate has to be considered.
10. Coatings on metallic surface by EB is harmful as it may generate X-rays.

Oligomers

The main function of oligomers are to contribute to such key properties as adhesion, tensile strength and flexibility to

the cured films. The structure of oligomers can vary depending upon their end uses.

Unsaturated Polyesters

These systems have mainly been recommended for wood finishing fillers and lacquers since they showed insufficient adhesion and flexibility for use on metals, plastic foils and paper. This involved mainly the use of these resins dissolved in styrene. Replacement of styrene by difunctional acrylates also give faster curing and in addition replaces the volatile styrene monomer with a less volatile monomer.

Acrylic and Acrylated Oligomer

Acrylate-based oligomers have found greater importance because of their excellent hydrolytic and light stabilities. They range from polyester resins dissolved in acrylic monomers to pure acrylic polymer dissolved similarly. Most frequently these consist of other polymeric backbones containing acrylic groups attached either as terminal or pendent group which are then dissolved in single or mixed acrylic monomers.

Acrylated Polyester

These are prepared by synthesising a polyester with an excess of hydroxyl group followed by esterification of acrylic acid. Both unsaturated and saturated polyester resin compositions prepared by this method, show satisfactory all round performance and are not outstanding in any particular property.

Acrylated Polyethers

Low molecular weight hydroxy-functional prepoxylated trimethylolpropane and pentaerythritol polyethers can be prepared by transesterification with ethyl acrylate using an organic titanate catalyst. These are low molecular weight resins which produce low-viscosity solutions even when they are dissolved in high-viscosity acrylate monomers. These resin systems tend to yield very hard films having low flexibilities and are therefore not recommended in the finishing of metal, plastics and paper.

Acrylated Epoxy Resins

These resins are obtained by reacting epoxy resins with two moles of acrylic acids, where the terminal epoxide groups react to form an acrylate terminated resin. These resins yield exceptionally hard films without using high proportions of di-, or tri-acrylate monomers. Aliphatic epoxy acrylates exhibit lower viscosity and greater compatibility range than their aromatic counter parts.

Acrylated Polyurethane

Hydroxyl-group containing acrylic monomers and polymers can be reacted with di-isocyanates or prepolymers containing an excess of isocyanate groups to produce radiation curable acrylated polyurethanes. These show improved film hardness and elasticity. Coatings based on these resins are capable of giving good cure speed combined with good all-round performance properties on a variety of substrates. The use of these resins has been recommended for use in near layers for resilient flooring, photopolymer printing plates, packaging coatings and for coating both paper and flexible plastic substrates.

Photoinitiators

An important criterion for photoinitiators is the presence of a bond having dissociation energy lower than the excitation energy of the reactive excited state, on the one hand, but sufficiently high to provide thermal stability, on the other hand. Photoinitiators include benzoin ethers, substituted acetophenone derivatives, acyloxime esters, benzyl ketals and cyclic benzoin and benzil.

Market Situation

Radiation curing technology is a comparatively new introduction to the ink, coatings and paint industries. New applications are constantly being developed, particularly as systems and equipments are improved. High technology industries are inclined towards saving cost and energy and are generally quick to switch over UV curing, e.g. electronics industry (PCB resists). Radiation curable adhesives, both laminating and pressure sensitive are a large potential growth area. The majority of radiation coatings are UV cured, while EB is confined to more specialised areas. A general idea of volume of usage for radiation curable systems is given in the Table 1.

Table - I

Year	000' Tonnes
1980-81	2.5
1982-83	4 - 5
1984-85	6 - 8
1986-87	11 - 14
1988-89	16 - 19
1990-91	21 - 22

Data from a targeted survey of customers of UV and EB curing in 1988 showed that 40% bought less than 454 kgs, 31% purchased between 4500 kgs. and only 3% bought more than 4,50,000 kgs. of materials per year. Exact volumes are difficult to obtain, because for most users the volume of the radiation curable material would be difficult to separate from their yearly chemical expenditure.

The other factors which could favourably affect the growth of radiation curing include:

(1) *Material Developments:* Lower cost coatings, coating with FDA approval for direct food application, better pressure sensitive adhesives, release coatings with a greater range of properties, lower misting inks for high speed printing, improved metal coatings.

(2) *Process Changes:* More wavelength specific UV curing lamps, more efficient reflectors, smaller EB units, improvements in application equipment, improvement in case of usage, lower cost equipment.

(3) *Market Changes:* Development of products based on radiation cure technology.

(4) *Association Growth:* Reaching a broader audience through innovative ways, corporative activities with industry and research institutes.

With the benefits to the environment, increased profitability, energy savings and performance improvements offered by radiation curing its application should enjoy a growth rate greater than 15% over the next two years.

Reliable estimation of the growth of the radiation curing market are difficult to obtain. The fact that it is growing is certain, however and this is corroborated by the manufacturer of the resin and monomers. In the past five years the market for raw materials has grown by 20-22% and is expected to continue growing at a healthy 8-15%, barring problems with the production and supply of the essential unsaturated acrylic materials.

Offset lithographic printing of sheet fed carton boards for the packaging industry is currently limited to a maximum speed of 9-10,000 impressions per hour (iph) by present printing press technology. It is anticipated that new press technology to be introduced in 1990 will attain running speed of up to 14-15,000 iph. It is considered unlikely that current formulations will allow much more than 10-20% increase in speed without the introduction of new resin technology from the raw material suppliers.

Formulation of a UV curable ink is dependent on its particular end use and the properties required by that end use. In addition, the method of application and type of substrate will affect the choice of raw materials used. A generalised formulation for a UV ink and varnish is shown in Table-II. Pigment choice will depend on shade required and end use limitations such as light fastness, bleed resistance, etc. The basic resin-monomer package needs to be fast reacting to achieve rapid cure. Particular choices depends on pigment, substrate and printing method. Resin type available include epoxy acrylates, urethane acrylates and polyester acrylates. The epoxy acrylates are generally fast curing and inexpensive compared to urethane and polyester acrylate. Their water-white colour makes them particularly suitable for varnishes. Polyester are often used to enhance lithographic properties and provide adhesion to plastic or metal substrates. Urethane acrylates may be used to provide flexibility in the red film for adhesion to flexible plastic surface.

Table - II

GENERALISED UV CURABLE INK AND VARNISH FORMULATION

	Ink (%)	Varnish (%)
Pigment	15-23	--
Resin	40-60	5-20
Monomer	10-20	50-90
Initiator	3-8	5-8
Synergist	2-5	3-5
Additives	1-3	1-4

Market size for UV and EB in Asia

It was in 1971 that UV curing made its commercial debut in Japan in printing industry. UV curing in Japan is moving into high gear, not restricted to printing industry, but also in other diverse areas with a great number (more than 20,000) of UV curing units in operation. Radiation curing in Asian countries other than Japan, such as Taiwan, Korea and China is following more or less, the trends of the conventional industrial applications in which UV and EB curing technology is used. Table-VII shows radiation curing production in Japan. The growth rate for application is phenomenal. The total resin production has increased from about 2,500 TPA in 1982 to 5,000 in 1986 to 12,600 TPA in 1989.

European Market for Rad-cure Products

The European rad-cure market started in 1972 and since that time has been steadily growing. Table III shows the evaluation of the total market in metric tonnes. From 1973 to 1981 the growth was regular and steady. These were the years of

Table - III

EUROPEAN MARKET FOR RADIATION CURE PRODUCTS

Year	000' Tonnes
1972	0.5
1975	0.7
1976	1
1979	2
1980-82	2.5 - 3
1983-85	5 - 9
1986-90	11 - 17
1990-95	19 - 30 (Estimated)

introduction of technology, but steadily new applications appeared and finally the technology proved its specific advantages which were recognised and accepted. In 1982-83 the market growth accelerated. The average annual growth from 1980 to 1990 is about 23% and from 1985 to 1990 it is about 20%. The expected volume growth for the next five years is estimated at 8% to 12% based on the volume of 1990. But it will depend upon how severe the anti-pollution regulations become. If the regulations are severe, the growth could be higher.

Table - IV
EUROPEAN MARKET BY CHEMICAL FAMILIES

Product	Tonnes
Monomers	10,000
Photoaccelerators	1,200
Epoxy Acrylate	4,000
Urethane Acrylate	2,000
Polyester Acrylate	3,000
Others	500
	21,000

Table - V
EUROPEAN MARKET BY APPLICATION FIELDS IN 1990

Applications	Tonnes
Lithographic Inks + Varnishes (UV + EB)	6,500
Overprint varnish (UV)	7,000
Silk screen inks (UV)	1,500
Wood + Plastics + Cork (UV)	4,500
EB Coating	1,500
	21,000

Table - VI
MARKET OF UV COATINGS IN ASIAN COUNTRIES

Country	Tonnes
China	50
Korea	500
Taiwan	1,000
Japan	3,000

Future Trends

EB curing represents 10 to 12% of the total volume. Interestingly, all the application fields have been growing during the last 10 years. The Graphic Art applications still represents slightly more than 70% of the total volume. Five to seven years ago, coatings represented only 15 to 20% of the total volume and Graphic Art accounted for more than 80%. In 1990 the ratio is about 71% for Graphic Art applications and 29% for coatings.

Table - VII
RADIATION CURING RESIN PRODUCTION IN JAPAN

Application	Tonnes (TPA)		
	1987	1988	1989
Printing Plate	1,800	1,850	1,900
UV coating	1,700	3,200	4,100
UV inks	1,550	2,000	2,400
Flexographic	1,200	1,300	1,500
Adhesion	100	120	150
Electronics	1,400	1,500	1,550
Resists	645	840	1,500

The future potential applications are summerised as follows:

1. UV pigmented and clear coating for wood finishing to replace acid curing systems in order to avoid solvents and the emission for formaldehyde.
2. Flexible and harder UV finishing on different plastics.
3. UV pigmented and clear leather finishing.
4. UV laminates, decoration or coatings on different glass substrates.
5. UV and EB permanent and removable pressure sensitive adhesives.
6. EB curing of intaglio inks for the printing of bank notes, postage stamps and other security printing.
7. UV cured PVC edge moulding application to automotive parts.
8. Thin radiation cured coatings can replace thicker and heavier laminating films.
9. EB paper upgrading will continue to develop new products.
10. Self supporting substrates may be obtained by radiation curing.
11. UV and EB curing of composite materials.
12. Antifogging films having a high water repellency suitable for several uses.

The most significant trend is that, the radiation cure market as a whole will continue to grow. The product and formlation which have some degree of irritiating or toxicity is greatly decreasing and has practically disappeared. The search is going on for less irritant product. Development of combined pressures like hybrid systems (radical and cationic) and dual curing (radical and thermal or the reverse, thermal followed by UV or EB curing). Overall market trends predicts that formulations based on acrylate chemistry will retain the greatest

Table - VIII

Application	1979 Million lb/yr	1979 % Market Share	1985 Million lb/yr	1985 % Market Share	Annual growth Rate %
Wood coatings	10	14.1	13	11.6	4-5
Metal coatings	8	11.3	10	8.9	3-4
Printing inks	6	8.4	11	9.8	12-14
Paper & Board coating	10	14.1	15	13.4	7-8
Flexible plastics	4	5.6	5	4.5	3-4
Resilient Flooring	10	14.1	16	14.3	8-10
Electronics	8	11.3	14	12.5	10-12
Photopolymer printing plates	8	11.3	14	12.5	10-12
Coating for electronics	2	2.8	2	1.8	2-3
Others	5	7.0	12	10.7	15-20
	71	100.00	112	100.0	

share of the market for the foreseeable future, because they are more versatile and offer broader application possibilities than other systems.

End Uses

Radiation cured coatings, which are often taken to include inks, adhesives, and sealants, are used in a large number of ways for rigid and flexible metal, plastic, glass, paper and wood substrates. Particular end use areas include the communication, construction, consumer products, electronics, graphic arts, medical/dental, packaging and transportation markets. Specific end uses for radiation cured compounds are numerous and include coatings for appliances, beer and beverages can bodies and ends, book covers, bottles and bottle caps, catalogs, closers, compact cartons, credit cards, decorative and functional foils and films, decorative mirrors, electronic components, flocked fabric, furniture tables, magazines, magnetic tape, natural and simulated wood panelling, optical fibers, orthopedic casts and splints, photo resists, plastic caps and containers, printed circuit board assembly (conformal coatings), record album jackets, solder masks, steel can ends for composite paper-metal can, toys, transfer letters and vinyl flooring.

Conclusion

The radiation cure market will continue to grow because:

1. Radiation curing saves time and money.
2. Radiation curing technology is productive and economic.
3. Floor space and energy is saved.
4. Radiation cure technology offers many industries the possibilities of eliminating solvent emissions and reducing waste, giving a clear world and more ecologically acceptable product.
5. Radiation cure films offer better properties than many traditionally cured films.

Due to high industrialisation, there is strong concern about greenhouse effect, whose radiation cure formulation contribute positively to solve the problem.

Environmentally Friendly Technologies in Leather Process and Waste Management

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Introduction

Pollution prevention in conjunction with cleaner technologies is a good long term option for tannery waste management problems. Developing environmentally friendly technologies in the leather process, waste minimization, recovery and reuse of chemicals, sound solid waste utilization etc. are considered important for the sustainable development of the Leather Industry.

Jajmau in Kanpur is an important centre for leather with 160 tanneries along the banks of river Ganga and constitutes the largest single cluster in the country. Annually 75,000 tons of cow and buffalo hides are processed in Jajmau which is about 15% considering the total quantity of 500,000 tons of hides and skins processed by all the 2000 and odd Indian tanneries. The tanneries in Jajmau adopt traditional vegetable tanning process using barks and nuts and also chrome tanning process.

The environmental pollution problems arising from the discharge of untreated effluent of about 9000 cubic meter/day from Jajmau tanneries directly to the river Ganga with high chromium content and generation of about 400 tons of solid waste have become a matter of increasing concern. Although the development and implementation of suitable treatment technology for tanney effluents is considered one of the important tasks to meet the pollution control standards, it is often emphasised that pollution prevention, and development of cleaner technologies are the best possible future solution. In view of this, the Indo-Dutch Environmental and Sanitary Engineering Project with the support of Central Leather Research Institute (CLRI), Madras undertook a comprehensive programme on tannery waste management for Jajmau tanneries as a part of the Indo-Dutch Project activity under the Ganga Action Plan. The Leather Institute (ILS/TNO, The Netherlands also supported the project activities on tannery waste management.

The project activity on tanney waste management is phased into six parts namely:

* Detailed inventory of all the 160 tanneries in Jajmau and data analysis.
* Characterisation of tannery wastewater including development of sampling procedure for feeding the Upflow Anaerobic Sludge Blanket (UASB) pilot plant.
* Performance studies on the pilot UASB system for combined treatment of tannery wastewater and domestic sewage.
* Tannery solid waste management aspects.
* Development and promotion of chrome recovery and reuse system.
* Tannery inplant modifications and development on Environmentally friendly technologies.

Tanning Process and Characteristics of Effluent

The tanneries in Jajmau adopt traditional vegetable tanning process using barks and nuts and chrome tanning process.

The chrome tanning process comprises of soaking, liming, fleshing using machines, deliming, pickling, chrome tanning, neutralization, dyeing, fatliquoring and finishing. Soaking operation is carried out in pits and paddles and all other operations are carried out in drums.

Out of 160 tanneries in Jajmau, 110 tanneries adopt chrome tanning process and 50 tanneries adopt vegetable tanning process.

Vegetable tanning process comprises of soaking, liming, manual fleshing, deliming and vegetable tanning using barks and nuts, oiling and drying. All the vegetable tanning operations are carried out in pits. The process flow diagram and primary effluent treatment system are shown in Figure 1.

The quantity of water usage and wastewater discharge varies from tannery to tannery, process to process and time to time. The average wastewater discharge is estimated based on field observations like measuring the pits, drums size, the number of hides processed etc. The consolidated data is given Table I.

The overall composite tannery effluent characteristics and pollution load from Jajmau tanneries are given in Table II.

Appropriate Anaerobic Treatment Technology

One of the treatment system combinations generally

* M/s. HASKONING, Nijmegen, The Netherlands.

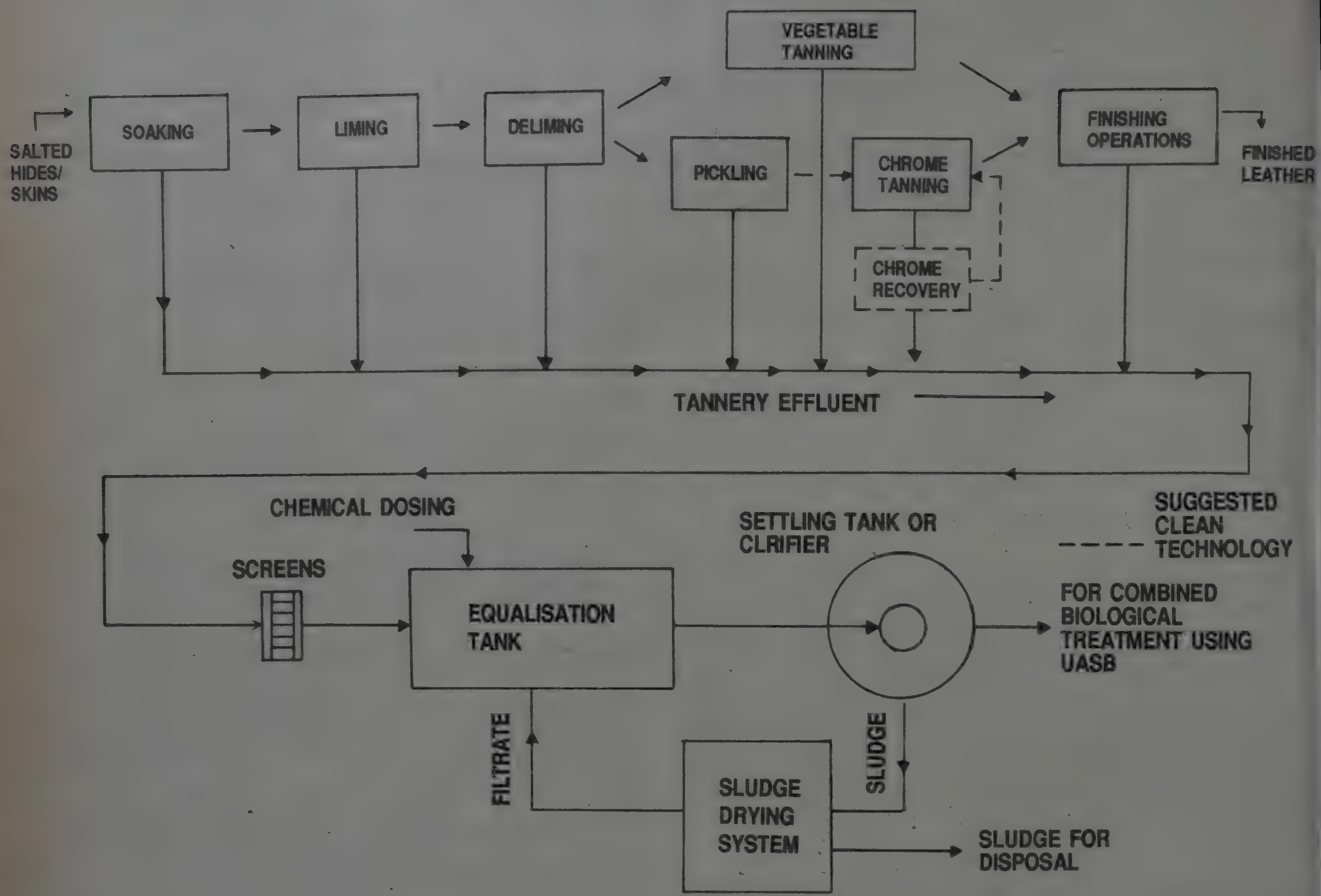

Fig. 1: Tanning Process & Primary Effluent Treatment System

TABLE I

Processwise capacity and total wastewater discharge from tanneries in Jajmau

Sl. No.	Type of tanning	Process capacity of hides in tonnes/day	Volume of wastewater discharge in cubic meter/day
	Chrome tanning process		
1.	Raw to upper	200	5,600
2.	Raw to wet blue	30	600
3.	Wet blue to finish	15	300
	Vegetable tanning process		
1.	Raw to sole	135	2,300
2.	Raw head pieces to vegetable tanning	20	200
	Total	400 Tons/day	9,000 or 9.0 MLD

TABLE II

Composite Tannery Effluent Characteristics and Pollution load from Jajmau tanneries

Parameter	Composite Tannery Effluent (mg/1 except pH)	Pollution loa[illegible] (kg/day)
pH	8.7	
BOD (Total) 5 days at 20°C	2500	1260[illegible]
COD (Total)	6000	3330[illegible]
Total solids	31600	17400[illegible]
Dissolved solids	26600	14850[illegible]
Suspended solids	4900	2300[illegible]
Chloride, as Cl	12800	7110[illegible]
Sulphate, as SO_4	2400	1360[illegible]
Sulphide, as S	90	49[illegible]
Chromium, as Cr	200	107[illegible]

adopted in the developed/developing countries for tannery effluent treatment is equalization cum mixing unit. Chem-

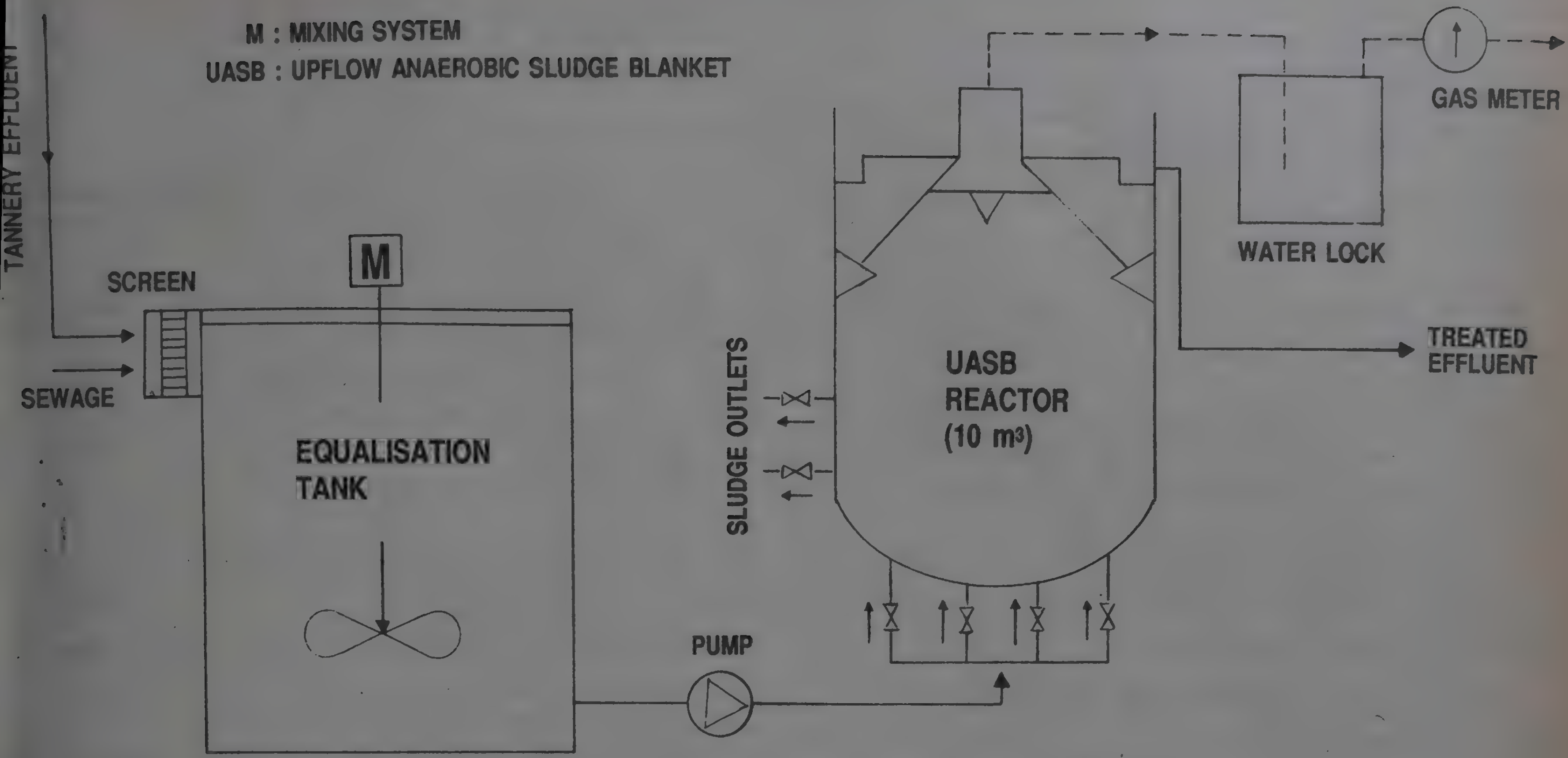

Fig. 2: UASB Pilot Treatment Plant in Pionner Tannery, Kanpur

cal treatment primary settling tank or clarifier two-stage aeration system with secondary clarifier. Possible alternative option in Indian tanneries could be by substituting the first stage aerobic unit by a suitable anaerobic unit to reduce the major pollution load. This system has certain advantages in terms of conservation of energy, reduction in the operation & maintenance and breakdowns.

Open anaerobic lagoons were installed in few South Indian tanneries adopting both vegetable and chrome tanning. The atmospheric temperature in South India generally in the range of 20°C to 40°C throughout the year. Due to high detention time (i.e. 10-15 days) and large land area requirement, lagoons are not considered suitable for large treatment capacity particularly near urban towns. Open anaerobic lagoon system is not generally recommended for North Indian tanneries due to cold atmospheric conditions (i.e. 5°C to 15°C) during winter will decrease the efficiency of the system. Hence, an alternative anaerobic system preferably closed type with less detention time was considered as one of the best possible options since the effluent temperature remains in the range of 20°C to 30°C. The change in the characteristics of tannery effluent especially the increase in the concentration of total dissolved solids, chloride and other chemicals due to the increase in chrome tanning operations and major fluctuations in the effluent discharge, it is imperative to mix the tannery effluent with domestic sewage before applying anaerobic treatment.

In view of the need for mixing the tannery effluent with domestic sewage for anaerobic treatment and easy availability of domestic sewage in urban towns like Kanpur, Calcutta etc. the Upflow Anaerobic Sludge Blanket (UASB) treatment by a modern anaerobic system with detention time of 6-8 hours was proposed for the combined treatment of tannery effluent along with the required quantity of domestic sewage. Though technologies like Reverse Osmosis are available for the reduction of total dissolved solids and chloride etc they are not viable for implementation. Hence, the only option to reduce the concentration of total dissolved solids and chloride is to mix the tannery effluent with domestic sewage and have combined treatment wherever feasible.

In view of the techno-economical advantages, the UASB system was selected. To establish its feasibility a pilot 10 cubic meter UASB reactor with capacity to treat 30-40 cubic meter/day of combined tannery effluent and domestic sewage was designed and erected in Pioneer tannery, one of the commercial tanneries at Kanpur. The layout of the UASB pilot-plant set-up is shown in Figure 2.

Performance studies on the different composition of tannery effluent and domestic wastewater reveals that the system for a retention time of 8 hours with tannery effluent and domestic wastewater at 1:3 ratio can achieve 60% reduction in BOD and 70% reduction in COD. The Studge produced from UASB is stable, less in volume and better in dewatering capacity. The biogas produced can be converted into energy and utlised for the operation of the entire treatment system. The capital and operational costs are 20-40% less when compared to the other conventional aerobic systems.

Based on the pilot plant performance an UASB system

with treatment capacity of 36,000 cubic meter per day is being implemented for the combined treatment of effluent from 160 tanneries and domestic wastewater in Kanpur. This is the first and biggest of its kind in the World.

Tannery Solid Waste Management

The Jajmau tanneries on an average generate about 400 tonnes of different solid wastes per day. Though most of them are utilized, the present traditional way of handling the solid wastes, unhygienic procedure adopted in transportation, drying, constraints in disposing them during monsoon etc cause serious environmental problems and health hazards.

The following three major types of tannery solid waste are considered important in view of their large quantity of generation and importance in terms of environmental pollution.

(i) Exhaust barks and nuts (75,000 tons/year)

(ii) Sludge from pre-treatment units (30,000 tons/year)

(iii) Fleshings and pelt trimmings (12,000 tons/year)

Exhaust barks and nuts

The environmental hazards caused by the use of the barks and nuts in the tanneries adopting vegetable tannery are:

i) Lot of dust and smoke are generated during crushing of barks and nuts. There is no provision to protect the workers and to prevent dust spreading into the open air.

ii) During tanning, transport, crushing, drying etc part of the bark is wasted and goes in the drain as sludge, may be contributing to choking of the sewers.

iii) For drying the wet exhausted bark, the open areas of the tannery, path ways outside the premises are used. Numerous piles of barks with dark brown colour are spread all over Jajmau. During rainy season, these quantities increase because of longer drying times.

iv) The bark spread over the area is causing stench and may cause secondary problems like fly and rodent attraction and leaching of tanning into the soil particularly during monsoon period.

v) Indirectly the use of bark may contribute to deforestation.

The following options were studied to reduce the environmental hazards caused by vegetable tanning and disposal of its wastes:

i) The use of tannin extract could be a feasible option.

ii) Centralization of bark grinding, leaching and drying. Centralized handling and processing would facilite the use of more sophisticated methods and reduce the hazardous effects.

iii) Centralized drying of the bark by using modern mechanical methods.

iv) Briquetting of bark.

v) Bark board. Possibly by mixing with wood chips, particle board could be produced.

Pilot scale initial trials on the collection, partial drying and briquetting of barks and nuts is found to be viable. The briquets made without binders can replace the coal in the boilers and can get about 30% more revenue for the tanners. Further pilot plant studies to extend the facility to a group of tanneries are under progress.

Chrome Containing Sludge & Chrome Recovery plants

About 30,000 tons of partly dried chrome containing sludge with chromium concentration of more than 2% on dry solid weight basis is produced per year. The only available option at present is to dispose the sludge in sanitary landfills. The most feasible solution is to recover the chromium through chrome recovery plants and reuse them in the tanneries to minimise the sludge transportation and disposal problem since the local body is not now allowing the tanners to dump the chrome containing sludge for the land fill.

In view of this a simple chrome recovery and reuse system has been developed to suit the local conditions of the traditional industry and pilot scale studies were carried out in one of the commercial tannery at Kanpur.

Commercial scale studies by CLRI had decisively established the following merits of chrome recovery process:

i. Possible to achieve continuous recycle without major variations in the quality of recovered chromium.

ii. The process ensures that unwanted salts are separated from the precipitated chromium to make the recovered product pure.

iii. Leather tanned with recovered chrome is in no way inferior to that tanned with fresh chromium salt.

iv. For a tannery with a processing capacity 5 tonnes/day, the capital investment for a chrome recovery plant is about US$ 15,000. Payback period for the additional investment is less than 1-2 years.

Many tanneries have now willingly started to adopt the chrome recovery system. As a promotional activity the Indo-Dutch Project in association with CLRI is providing technical know-how for five full scale chrome recovery units in Jajmau. Many technological improvements have also been made in the commercial scale chrome recovery units. The

development of chrome recovery and reuse system project is considered as one of the break through in the promotion of cleaner technology in the Indian tanning industry.

Fleshing and Pelt trimmings

The fresh fleshings emit ammonia, amines and hydrogen sulphide. If not dried timely, the fleshings start to rot and pose health risks especially to the driers. Insects, birds and dogs spread the contaminated waste. Especially during the rainy season, the situation aggravates.

Possible solutions to the hazards caused by drying of the fleshings in open yards are:

i. Processing of fleshings to glue with drying facilities in a sophisticated glue factory to be established nearby.

ii. Sohisticated drying of fleshing in central place. Feasibility study is being undertaken by the Indo-Dutch Project to solve the open yard drying problems in Jajmau area.

Inplant Modifications & Environmentally Sound Solid Waste Disposal

Introduction of inplant changes and environmentally friendly technologies in the process of leather manufacture may be considered as one of the leather industry. But, it is considered to be much more difficult to introduce new procedures in the tanneries than to treat effluents leaving the existing procedure undisturbed.

Though many inplant modifications options are available, their implementation is depending upon the technical feasibility and economical viability and also related to the type of common effluent treatment system to be implemented, level of pretreatment system to be initiated and operated in individual tanneries, mode of treated effluent disposal, pollution control regulation etc.. In the present contest the follwing general inplant modifications are recommended for implementation in Jajmau tanneries.

1. The chrome recovery and reuse is proved to be technically and economically viable from the pilot plant studies and as well as from five full scale commercial units. The Jajmau tanneries can profitably adopt this technique. It will also minimize the disposal problem of the 30,000 tonnes of sludge.

2. In all the tanneries a proper collection pit and screen shall be provided before discharging the tannery waste water into the industrial sewer. A screen with rotary self cleaning system is recommended for big and medium scale tanneries. A simple type of screen with gravity flow is recommended for small scale tanneries.

3. The mixing of rain water into the drain within tannery premises should be avoided. Otherwise it will lead to problem in the industrial sewer, pumping and common effluent treatment plant.

4. The dusting of salt before soaking would reduce the salt content in the tannery wastewater. A simple rotary drum can be used for dusting of salt in big tanneries. Manual dusting can be adopted by the small tanneries. However, state authorities have to find out suitable ways and means for the collection and disposal of the dusted salt without washing taking place during rainy season.

5. Briquetting of barks and nuts proved to be environmentally sound and economically viable option. The briquettes can replace partly the use of coal in the boilers.

6. Establishing a modern glue factory with sophisticated drying system for fleshing is recommended to improve the local environment and to get better revenue for the tanneries.

Acknowledgement

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Realization of this technology development would not have been possible without the enthusiasm of the whole Indo-Dutch project team under the overall coordination of Mr. J.E. Schaapman, Project Director from Haskoning, The Netherlands and the cooperation of Jajmau tanneries. The contributions of Mr. H.H.A. Pelckmans, TNO/ILS, The Netherlands and Mr. J.A.W. Mass, Resident Engineering on behalf of Haskoning in Kanpur are highly appreciated. Mr. Abdullah Khan, Project Co-Director from Iramconsult has contributed to the extension of this technology to other tanneries especially its institutional aspects. AIC, Bombay was involved in the design engineering and implementation of the UASB system. U.P. Jalnigam was the executing agency of the pilot plant.

Dr. G. Thiyagarajan, Director, CLRI is instrumental for the active involvement of CLRI in the Indo-Dutch project under Ganga Action Plan. Under the coordination of Dr. K.V. Raghavan, Deputy Director and Dr. S. Rajamani, Project Team Leader and Senior Environmental Engineer, Mr. R. Suthantharajan and Scientists of CLRI from Kanpur and

Madras closely monitored the pilot plants and fuel scale plants and done laboratory studies.

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Earthquake Protection in India

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British Geological Survey

The earthquake of 19 November, 1991 in northern India occurred in the well-known Himalayan belt of seismicity. It has a number of precedents and was, therefore, not unexpected. It is clear that whilst the highest level of activity occurs in the north along the Himalayan belt, the rest of the country is not free from the effect of strong earthquakes.

The earthquake of 19 November 1991 in northern India caused at least 2,000 fatalities, a similar number of injuries and the loss of some 18,000 buildings in the Chamoli-Uttarkashi area. In this epicentral area, landslides were triggered and a 30 metre-deep crack was observed. Further afield, damage was reported from Chandigarh and New Delhi.

With a magnitude of 7.1, this earthquake was large by world standards but was much smaller than the great earthquakes (in excess of magnitude 8) which can happen. It occurred in the well-known Himalayan belt of seismicity, has a number of precedents and was, therefore not unexpected. Figures 1 and 2 show the known seismic activity within 500 km of Delhi and throughout India, respectively. It is clear that, whilst the highest level of activity occurs in the north along the Himalayan belt, the rest of the country is not free from the effects of strong earthquakes.

Earthquake protection can be improved by understanding probability of the occurrence of strong earthquakes in different regions (the hazard) in order to focus available resources in those regions. The total risk from earthquakes also depends on the vulnerability of the buildings exposed to them, including the vulnerability of the foundation soils and siting, both of which can have a marked effect on the way the seismic shock waves are transmitted to the building. Whilst the earthquake hazard cannot be reduced, the overall risk can be if measures are taken to reduce the vulnerability of the buildings and if people take certain precautions during the earthquake. The last requires a preparedness which can be acquired only through appropriate training programmes. The prospect exists of precise earthquake predictions which would lead to effective temporary evacuation, but the science is still in its infancy.

Hazard assessment

For the world as a whole, we already know where the biggest earthquakes are most likely to strike. However, in order

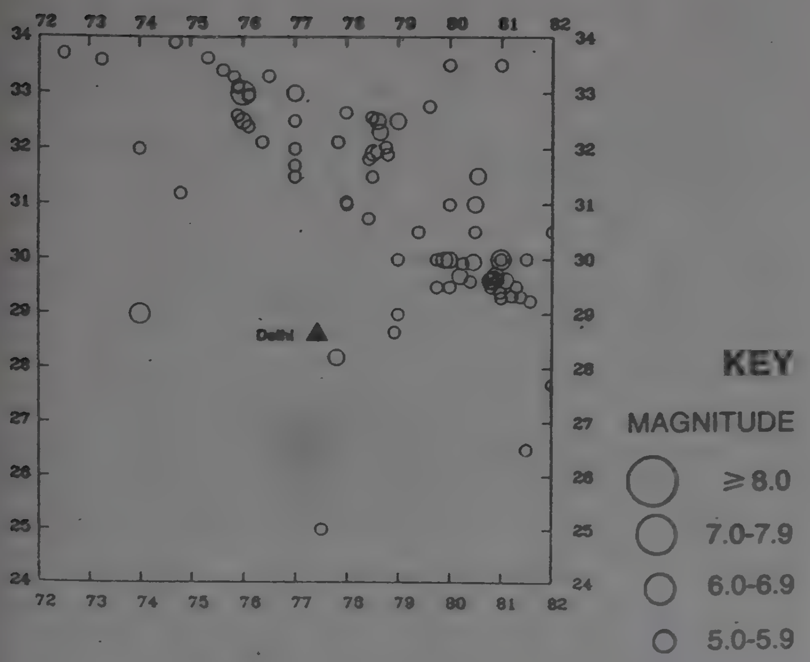

Figure 1: Larger earthquakes within 500 km of Delhi during the 20th century

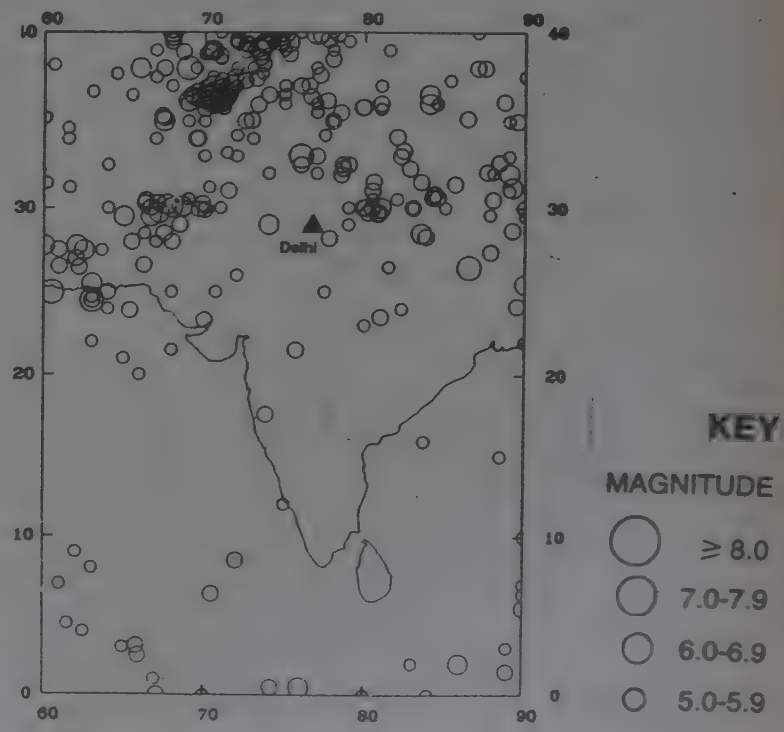

Figure 2: Larger earthquake in India during the 20th century.

to focus limited resources on to those areas of a country most at risk, it is necessary to understand the pattern of earthquake activity more precisely and to put a quantitative probability to the likelihood of occurrence of strong earthquakes. This is a seismic hazard assessment and it is a broad-brush way of predicting earthquakes, although it cannot provide the exact time and magnitude of the next one.

In every populated region exposed to earthquake hazards, valuable information already exists. Some is in the world databases covering the past few decades of modern global monitoring, some in local historical records and some in the geology and tectonics of the region. To be useful in hazard assessment, all of this information must be the subject of a special study to extract, integrate and interpret it in order to calculate the hazard. This applies equally to the objective data on modern earthquakes in order to provide sufficiently accurate focal parameters, as bulk processing of data on a global scale rarely gives the necessary accuracy or completeness for a local or regional assessment. A hazard study based on existing information can start immediately, give early beneficial results and illuminate deficiencies to be tackled with new data acquisition.

Seismic monitoring

In order to refine the initial assessment of hazard, based on existing informaton, it is necessary to monitor seismic activity with modern instrumental networks of seismographs. They are needed to:

* Precisely locate the seismic activity of the region, thereby identifying the presence and parameters of known and 'hidden' faults and providing information on seismogenic depth zone.
* Rapidly obtain data on small earthquakes which can be used, through a scaling process, to simulate larger ones. In that analysis, many of the uncertainties of local site effects, resonances, attenuation, depth and focal mechanisms can be taken into account. In the longer-term, accurate information will be obtained on strong ground accelerations caused by large earthquakes.
* Determine the characteristic source frequencies of any larger events which occur and model the attenuation characteristics of the region which strongly affect earthquake hazard calculations.
* Determine stress directions from focal mechanisms.
* For felt earthquakes, provide a comparison between the instrumental and macroseismic (felt report) method of locating and sizing earthquakes. This affords a calibration of the historical, pre-instrumental record on which the seismic hazard is also based.

Secondary hazards

Geological, geographical or geotechnical factors, not directly related to the earthquakes or their causes, constit secondary hazards which must be taken into account in overall seismic hazard assessment. The Mexico earthqua in 1985 was a dramatic (and simple) example of how, giv an exposure to earthquakes, the local geology can radica influence their impact on buildings, lifelines and the co munity. In this case, because of a (predictable) ground res nance in response to a distant large earthquake, almost of the losses were restricted to buildings in the 6 to 20-stor category on a particular foundation soil. Elsewhere, the co munity was barely inconvenienced. In the more general cas the prediction of topographic effects, ground motion amp fication, slope instability and liquefaction all need to be st died together with the planning and engineering actions be taken, in order to mitigate the effects of such problem

This whole area is one which has been neglected worl wide and which is pertinent to the objectives of the IDND Much theory already exists and the need is to develop ec nomical methods of application in representative regions, test the predictions with observation and, through those ca histories, to transpose the results to other similar regions. large part of the expanding world population is being accor modated in areas where the foundations are vulnerable.

Vulnerability

The great majority of casualties in an earthquake are cause by the collapse of buildings and, much of the subsequent ec nomic losses and disruption to the community result fro these collapses and from the interruption of lifelines (tran port systems, water supply, sewage, etc). Therefore, aft assessing the likelihood of the occurrence of a strong eart quake, the next step is to assess its impact through a vu nerability study. That is, to determine the probability th buildings and structures of any particular type will sustai damage at different levels of ground shaking. The vulne ability is a function of the strength of the buildings, its desig and the materials with which it has been constructed.

There are large uncertainties in the assessment of build ing vulnerability, but it is a necessary first step if limite resources are to be targeted most effectively. It must b remembered that whilst we have increasing understandin of earthquake occurrence and the ways in which new buil dings can be designed to withstand their impact, the greates risk over the next few decades is to building stock that i already in existence. One of the most effective ways o furthering vulnerability assessment techniques is to study, i detail, the effects of contemporary earthquakes, both in th region under consideration and in similar environments else where (then importing the experience). This strategy also pro vides a test of any protection measures previously taken i the zone of strong ground shaking.

In the seismology and earthquake engineering communities, the terms risk and hazard have different meanings such that:

seismic risk = seismic hazard x vulnerability

If there are no people and no structures in an area of high hazard, there is no risk because the vulnerability is equal to zero.

Earthquake engineering for ordinary building

Large, engineered industrial buildings, hotels, power plants, dams, etc. are generally built with seismic protection, even in developing countries, through the guidance and requirements of the funding agencies and engineers from the industrialised world. For ordinary buildings, where most casualties are caused and where the economy is hard-hit through the disruption of small businesses and infrastructure, it is essential to find the methods and educational programmes to permit:

* The building (and rebuilding, after an earthquake) of houses which will better withstand the next one:
* The retrofitting of existing vulnerable buildings, which form a vast stock in need of treatment before the next disaster.

In neither of these areas has there been much research or application of known methods in a way which leaves a community better able to look after itself for generations to come. It is not sufficient for agencies to move in with alien materials and an alien culture and often rebuild in the wrong place. At the most, such action might satisfy one generation at high cost.

Earthquake prediction

Whilst hazard assessment provides information on the probability of an earthquake occurring, which is a crude form of forecasting, efforts are being made to seek a way to predict where, when and how big an earthquake will be within time and space limits which are going to be useful in evacuating people, closing schools and factories, taking precautions with electricity, gas, oil and water supplies and bringing emergency services to full alert. This is proving to be very difficult. The Chinese seismologists, however, failed to predict the Tangshan earthquake 18 months later, in which over half a million people died. In some earthquake-prone areas of the world, particularly along the simple, linear-plate boundaries, gaps can be observed where there has not been a recent large earthquake. As the strain build-up along the boundary is largely uniform, identification of these gaps is a way of predicting earthquakes which lie between the probablistic hazard method and attempts at truly deterministic prediction ('where, when and how big'). Because of its apparently unique cyclical behaviour, a section of the San Andreas fault at Parkfield in California is being studied in great detail because it is the most likely place to find precursory phenomena and to develop prediction techniques. Changes are being sought in the pattern of small earthquakes, in crystal deformation, waterflow, electric and magnetic fields, among others. In the 130 years since the great southern California earthquake of 1857 (which ruptured the San Andreas for hundreds of km to the south of Parkfield), a series of earthquakes with moderate magnitudes of about 6.2 have occurred on the Parkfield segment with a near 22-year regularity. The next one is becoming overdue. Whilst this is one of the most studied areas, earthquakes prediction research is being conducted in several other parts of the world, including Japan and Turkey. In the UK the British Geological Survey (BGS) is developing techniques to interpret the information imparted to shear waves as they pass through an earthquake preparation zone, in which stress changes affect cracks and fluid distribution in rocks which are anisotropic to shear wave transmission.

Whilst research into deterministic earthquake prediction will have longer-term benefits, it is important to recognise that hazard and vulnerability assessments (including research into site effects), together with the development of techniques to cheaply improve the risk to existing buildings and lifelines, have greater short-term impact. It may be of only marginal advantage to predict an earthquake in the Philippines, for example, if a large part of the population have their lives ruined economically through the loss of commercial buildings and because bridges and roads collapsed anyway. For communities in which new building construction and repairs and strengthening to old ones are done at a small-scale, local level, training programmes are needed to incorporate earthquake-resistance. To succeed, such programmes need to be sensitive to existing custom, culture and materials and to the (often low) level of literacy and education of the recipients. Regardless of whether engineering and planning measures have been taken, there are many things which can be done by individuals before, during and after an earthquake to reduce its consequences.

They include such things as knowing how to shut off water, gas and electricity, having a torch on hand, keeping heavy objects off the tops of shelves, securing heavy items which may topple, learning first aid, holding earthquake drills. During the earthquake: if indoors, people should watch for falling objects, keep away from windows, mirrors and chimneys, should not automatically rush outside; if outside, they should stay in the open away from buildings and electrical cables. Immediately after the earthquake, they should check for fires, check and shut off utilities, not use naked flames, avoid power cables, clean up spilled poisons or harmful materials, obtain emergency water supplies and check sewage lines. The injured need care, appropriate to the severity of their injuries.

Damaged buildings need to be avoided because of aftershocks and waterfront areas because of the threat of seismic sea waves (Tsunamis).

UK strengths

British earthquake seismologists were in the vanguard of the development of seismology in the last century and early in the 20th century, when Richard Oldham deduced the broad structure of the Earth's interior, using records from the first global network of seismometer stations established by Milne, with the backing of the British Association. Those strengths, on the world stage, continued for many years and, although fragmented more recently, the capabilities remain in existence in institutions such as the British Geological Survey, Imperial College and the Universities of Durham, Cambridge, Edinburgh, Leeds and East Anglia. Earthquake engineering expertise has been expanding and becoming more cohesive in recent years with the British construction industry adopting new techniques in its overseas markets. In the research area, the engineering has been boosted by a five-year programme supported by SERC, during which a number of institutions have become established as centres of excellence in complementary areas. They include Bristol, Cambridge, Glasgow and Nottingham Universities and Imperial and University Colleges, London. Under the Institution of Civil Engineers, the Society for Earthquakes and Civil Engineering Dynamics (SECED) has provided a forum for bringing together experts in the seismological and engineering fields. Its "Directory of Practitioners' provides a more detailed register of UK's capabilities in the field and, although not listed there, Cambridge Architectural Research is one of the UK leaders in the problems of vulnerability and community protection. Many of those practitioners contribute to the UK's Earthquake Engineering Field Investigation Team (EEFIT) which strives to learn from the effects of significant earthquakes, worldwide, and to disseminate that knowledge, through the seismological and the engineering community.

Summary

In order to reduce the impact of earthquakes, the first steps needed to be taken are:

* Identify faults or zones likely to produce earthquakes
* Estimate the probability of a damaging earthquake in say, a 30 year period.
* Predict the expected level and duration of shaking at sites of interest for the expected earthquake, allowing for the amplification effects of local geology.
* Identify sites where the ground is likely to fail through faulting, liquefaction or landslide.
* Assess the vulnerability of existing structures and protect against collapse.
* Pinpoint weak links in lifelines: transportation, water, electricity, sewers, telephones.
* Raise the level of community awareness to the earthquake threat and the protection measures which can be taken.

News from Abroad

PROBE PREDICTS "OVERNIGHT" CHANGES IN OXYGENATE AND CHEMICAL MARKETS DUE TO GASOLINE REFORMULATION

How fast will gasoline reformulation change global markets for MTBE, methanol, ethanol and other oxygenates? "Overnight", explains **Fred Peterson**, President of Probe Economics, Inc. (Millwood, NY). "The combination of clean air legislation and raw material supply limitations have already begun to alter oxygenate markets, and could entirely transform them during the Nineties.

A wild market

"Oxygenates are a wild market", says Peterson. "Petrochemical producers, energy companies and just about everyone else see oxygenates as the hottest game in town", he says, "and all of them want a piece of the action". World oxygenate demand in the year 2001 could be more than 10 times what it is today.

While producers hungrily eye potential gains, they should also acknowledge the risks, says Peterson. "If only a handful of countries pass clean air laws, the market will decide which oxygenates refiners use and what they pay for them", he explains. "The industry can cope with that, though it will make some MTBE plants unprofitable".

Problems crop up if more countries reformulate to reduce (toxic) aromatics and improve air quality. "MTBE makers will not be able to find enough butane feedstock to meet demand without disrupting petrochemical markets and perhaps even running out of butanes", warns Peterson. Prices for some chemicals, such as propylene, benzene, and toluene will drop, while ethylene and ethanol prices soar. Ethanol tabs could rise high enough for fermentation plants to show a profit without subsidies.

Selected Impacts of Gasoline Oxygenation on Prices

	1991	1997	2001
Fuel Ethanol, $/gal			
Limited Oxygenation	1.27	1.51	1.52
Extensive Oxygenation	1.27	1.82	1.82
Ethylene, $/lb			
Limited Oxygenation	0.22	0.21	0.23
Extensive Oxygenation	0.22	0.31	0.27
Propylene, Chem Grade, $/lb			
Limited Oxygenation	0.17	0.16	0.19
Extensive Oxygenation	0.17	0.12	0.20

World economic interactions

Peterson draws his conclusions from Probe's new study, *World Methanol, MTBE, and Fuel Ethanol Markets: The Impact of Gasoline Reformulation*. The study forecasts both a limited (Path A) and an extensive (Path B) oxygenation scenario. It builds upon Probe's well-received 1990 oxygenates report, which focused primarily on U.S. supply and demand.

Probe bases its forecasts on a proprietary model of worldwide economic, energy, and chemical interactions. Countries are clumped into strategic groupings that share the same type of resources and economic growth patterns. "Using the model keeps us honest", says Peterson. "It captures many subtle interactions between different chemical and refining sectors, and ensures that all forecasts are consistent from beginning to end".

Two forces batter markets

Probe sees two forces transforming world oxygenate markets. Clean air legislation created one of those forces, and feedstock shortages unleashed the other. The U.S. Clean Air Act created the initial pull for oxygenates, explains John Johnson, a Probe consultant and key contributor to the report. The law requires refiners to reformulate gasoline to reduce vapor pressure, reduce the aromatics content and increase the oxygen content. Lower volatility will reduce the release of all gasoline components to the atmosphere. Aromatics provide octane, but they are toxic and promote air pollution. Oxygen improves combustion and reduces the amount of carbon monoxide and other incompletely burned hydrocarbons from entering the atmosphere.

U.S. refiners must increase oxygen content to 2.0 to 2.7 per cent of gasoline by weight in the affected regions of the country. Other regions will follow. Oxygenates, such as MTBE, ethanol, and methanol provide both octane and oxygen. Most refiners prefer MTBE because they can make it within the refinery, blend it easily with gasoline, and transfer the reformulated mix through existing pipelines. Ethanol provides more oxygen than MTBE per unit weight, but fermentation plants remain expensive (despite government subsidies) and distant from refineries. Methanol is a cheap source of oxygen but blends poorly, entails storage and transportation problems, and damages existing autos.

Not enough butanes

The other force buffeting oxygenate markets is butane supply. Producers

isomerise butane into isobutane, dehydrogenate to isobutylene, and react it with methanol to yield MTBE. Most refiners blend butane, a very volatile hydrocarbon, directly into gasoline, or use it in alkylate for gasoline. "There is only a limited supply of butanes, which come from natural gas (LPG) or crude oil", says Johnson. Refiners are shifting butane to MTBE production to meet the demand for oxygen in reformulated gasoline. To grow, MTBE will have to pull additional butane molecules away from alkylation units.

A problem of global dimensions

"The United States thinks it's safe. But what happens", he asks, "when Tokyo, Mexico City, and Seoul decide to cut back on smog and toxic emissions? or when countries with growing octane needs shy away from aromatics and opt for oxygenates"? "Everything will come at us in a global fashion", says Johnson. "No one is counting the butane molecules, and there is only a limited economic supply of them".

Available butane supplies in the market economies will permit production of only 1.3 million barrels of MTBE per day, which is enough to oxygenate the market economy motor gasoline (mogas) pool to 8.3 per cent by volume — not as much oxygenation as is being mandated in the U.S. This limits the amount of methanol that can be sold as MTBE to 20.4 million tonnes per year — only about a doubling of current world methanol capacity and less than has already been announced or, at least, discussed.

Maximum Market Economy Oxygenate Production Permitted By C4 Availability in the Year 2001

Refinery Runs, MMbpd	56.7
Mogas Demand, MMbpd	16.3
MTBE Production, MMbpd	1.3
Average MTBE Concentration, vol%	8.3
Methanol Consumed as MTBE, MMtpy	20.4

Companies that have not counted the butanes could overbuild MTBE capacity. Since producers tap the cheapest isobutylenes first, the newest MTBE plants will have to pay higher prices for those that are left, and probably will have to make them out of butanes at an even higher price. Those companies most likely to reap MTBE profits during the Nineties are those with cheap captive isobutylene or price protection on the buy or sell side.

The safest projects will sell MTBE on a cost-plus basis or have feedstock cost protection. What happens if countries around the world start to pass clean air laws? Probe's B Scenario details what a real butane crunch would look like. To ensure enough butanes to meet oxygenate demands, governments would have to mandate reductions in gasoline volatility. That would drive butanes from gasoline into MTBE production.

MTBE production would not be adequate to meet oxygenate demand. That would force refiners to turn to ethanol and other oxygenates. Oxygenates would then compete on the basis of oxygen content. Ethanol prices could then rise high enough to provide a profit without subsidies and keep MTBE prices and returns disconcertingly low.

Unless methanol producers see this coming, they may overbuild to supply MTBE plants. If butane availability limits MTBE production, methanol prices will collapse. Any methanol shakeout will favor producers in developing nations who make methanol from natural gas they now flare. Since that gas has no alternative value, they start with zero-cost feedstocks and can survive a price shootout. Scenario B also foresees a collapse in aromatics prices. "The big market aromatics is the refinery", says Johnson. "Gasoline toxicity limits could drive them out of it". This would create an enormous oversupply that would drive down the price of such key aromatics as toluene and benzene.

If butane grows too valuable to justify alkylating propylene, the freed refinery propylene would flood the market. This would drop propylene prices, reduce its byproduct credit contribution to ethylene costs, and drive up ethylene prices dramatically.

Probe's 178 page study, *World Methanol, MTBE, and Fuel Ethanol Markets: The Impact of Gasoline Reformulation,* contains 110 charts, tables, graphs, and figures. It costs $4,500; buyers can have multiple copies or the study results as Lotus 1-2-3 (TM) diskettes for an additional fee. For additional information, contact Probe Economics, Inc., 358 Saw Mill River Road, Millwood, New York 10546 U.S.A.

GREENHOUSE EFFECT APPEARS INEVITABLE

It's already too late to avert some of the damage the earth faces from global warming or the "greenhouse effect" according to the Worldwatch Research Institute, in a report on the planet's future. Because of the greenhouse gases already in the atmosphere, a one-degree (celsius) warming "sufficient to cause major biological disruption appears inevitable during the 21st century", said a "Worldwatch paper".

The report, released in the last week of April said global warming, population growth and excessive consumption are accelerating the "mass extinction" of all kinds of life that share the planet with the human race. Worldwatch, financed by UN organisations and private foundations, is an institution dedicated to research and public education on environmental issues.

The report's release came ahead of a final round of UN talks that seek a treaty to curb global warming. The treaty would be signed in June at the UN environmental summit in Rio de Janeiro, Brazil. The US has resisted proposals by the European Community and Japan to agree to roll back emissions of carbon dioxide, the main gas behind the greenhouse effect, to 1990 levels by the year 2,000. President Bush's administration has opposed specific limits as an unreasonable burden on industry while calling for more research of the issue.

The Worldwatch Institute Director, **Mr. Lester R. Brown,** told newmen in Washington however, he hoped for a last-minute compromise and one appeared possible. The US State Department has been distributing to embassies a position paper about the US being able to achieve 95% of the rollback to 1990 levels of greenhouse gases through its existing Clean Air Act and other measures in progress. At the White House, officials said Mr. Bush was waiting until after UN talks to decide whether he would attend the Rio meeting. Mr. Bush has expressed interest in attending, but only if an acceptable accord is likely. The new paper by Worldwatch associate **John C. Ryan** called for immediate steps to protect the earth. Long-term biological conservation will be impossible without rapid reductions of greenhouse gas emissions, achieved through such measures as energy efficiency and conservation ..... and restoration of forests", Ryan said.

"Unfortunately, these efforts alone will not keep the earth tolerable for its natural and human communities" because of past releases of gases", Mr. Ryan added. He quoted findings of environmental scientists **Robert L. Peters** and **J.P. Myers** in the US National Academy of Sciences quarterly issues in science and technology.

Even small rises in temperature, Mr. Ryan said, "will overwhelm many species and ecosystems ability to adapt. Disappearance of forests, tundra and coral reefs, disruption of animal migrations and the loss of mangroves and other wetlands to rising seas are likely in the coming decades if actions are not taken soon to slow global warming".

News From Japan

PRINTING INK DEMAND SUDDENLY RECORDS LOW GROWTH RATE

Demand for printing ink is cooling down fast. Shipment of tinplate ink, centered on demand from manufacturers of cans for beverages, increased by 5% over the level of the preceding year in 1991. However, shipments of special gravure ink, lithographic ink and other kinds of printing ink remained at the level of the preceding year. From January this year, too, shipments seem to have remained below the level of the preceding year.

Demand for tinplate ink, which recorded the highest rate of increase, had continued to grow rapidly until July last year, but shipments fell below the level of the preceding year in November and December. As in the case of other kinds of printing ink, demand has fallen remarkably.

It seems that demand for lithographic ink cooled down suddenly due to the decrease in the volume of advertisements, pamphlets and catalogs of real-estate, passenger-car and big supermarket enterprises. Demand for special gravure ink, which had been increasing due to the use of packages for foods, and other items and shopping bags, has ceased to increase due to self-reflection on excessive packging and other reasons. Demand for newspaper ink, too, has ceased to increase due to the switchover from relief cylinders to offset cylinders in the course of the progress of colorisation.

During the past several years, demand for printing ink continued to grow more rapidly than the GNP, with the increasing demand from publishing and advertising enterprises, colorisation of newspaper advertisements and leaflets and the increasing demand from catalogue-sales magazines in the background. Affected directly by the advent of a period of business recession, however, demand has been decreasing conspicuously since the second half of last year. Among printing-ink manufacturers, the view is gaining ground that the environment will remain severe hereafter.

VANADIUM OXYTRICHLORIDE PRODUCTION CAPACITY DOUBLED

Shinko Chemical Co. has doubled production capacity for vanadium oxytrichloride to 300 t/y at its Sakai factory. Production will gradually be switched from old to new facilities. The product is used mainly as a catalyst for initiating polymerisation of ethylene propylene diene terpolymer (EPDM). EPDM demand in Japan has continued to attain double-digit growth over the past several years for use in car manufacture and building construction. In addition, EPDM is being increasingly employed for a modifier for polypropylene and other synthetic resins.

Supplying its products to manufacturers of fine chemicals and photosensitive materials, Shinko Chemical is a leading producer of vanadium, selenium and their compounds, commanding the largest shares in the domestic markets for some of them.

PROFITS DECLINE FOR MOST SMALL DRUG MAKERS

The Ethical Manufacturer's Association — an organisation for small and medium-sized pharmaceutical companies — recently issued a report on the results of a questionnaire conducted last December.

According to the report, 51% of respondents to the questionnaire attained operating profits lower than those shown in the results of the survey conducted last year. Regarding estimates of business showings this fiscal year, only 17.6% of the respondents claim their operating profits will exceed the previous fiscal year's level. 49 companies provided a response to this year's questionnaire. Those capitalised at less than ¥5 million accounted for 82.6%, while those with sales below ¥6 billion made up 67.3%. Respondents with 300 employees or less accounted for 88.5%; companies with less than 100 persons in charge of medical information, 78.8%.

Looking at the average sales of the 49 companies, the sales in 1990 stood at 115 against the 1987 base figure of 100, but operating profit decreased to 94.3 and pre-tax profit fell to 88.4, with their rates declining to 82.1 and 76.9. Upon division of sales into below ¥10 billion and above ¥10 billion, the sales of 41 companies with the sales below ¥10 billion increased to 108.9, while operating profit fell to 82.6 and pretax profit declined to 52.8.

8 companies with the sales above ¥10 billion registered sales of 119, operating profit 100.8 and pretax profit 105.3. Thus the gap stemming from market scale widened further. Companies with the sales above ¥10 billion, however, do not catch up with leading new drug manufacturers in terms of increases in sales and profit.

JAPAN-CHINA JV FOR ACETATE TOW FOR CIGARETTE FILTER AGREED ON

A Japan-China joint venture for production of acetate tow for cigarette filters is scheduled to be inaugurated in Xi'an, China following negotiations between the two sides which lasted about 10 years.

Daicel Chemical Industries Ltd. and Mitsui & Co. plan to establish this summer Xi'an Huita Chemical Industries Co. in Xi'an in collaboration with two Chinese interests. The joint company — owned 30% and 70% by the Japanese and Chinese sides, respectively — will build an 8,000-t/y acetate-tow plant in Xi'an with startup slated

for the end of 1994. Feedstock (cellulose acetate) will be supplied by Daicel Chemical, who intends to expand the production capacity concerned by 25,000 t/y at the end of September, thereby boosting it to 122,800 t/y. The company has to date exported acetate tow to China.

China is the world's largest cigarette producer, turning out 1,600 billion pieces (30% of world's combined production). About 50% of them come with filters. It is forecast that China's cigarette production will increase by 50-100 billion pieces a year with the share of filter-fitted cigarettes rising 3-5% every year.

There will, therefore, be steady growth of Chinese demand for filter tow. China's tow demand is put at 90,000-100,000 t/y, most of which is imported from abroad — 15% (10,000 t/y) coming from Daicel Chemical and 65% from Hoechst Celanese and Eastman Chemical (U.S.). The balance of 20% is domestically produced in joint ventures with U.S. corporations.

KUREHA, HOECHST TO PRODUCE PPS RESIN, COMPOUND IN U.S.

Kureha Chemical Industry Co. announced March 31 that it will construct together with Hoechst Celanese Corp. of the U.S., a 3,600-t/y U.S. plant for polyphenylene-sulfide (PPS) resin and compound in Wilmington, N. Carolina. PPS is an engineering plastic used for auto parts and electronic equipment.

The two firms could already set up in May an equally owned joint venture, Fortron Industries, for U.S. production and marketing of Kureha's "Fortron" PPS resin and compound. Construction is to commence before this August, with completion set for December 1993.

As "Fortron" has a direct-chain molecular structure, as opposed to a crosslinking structure high levels of shock resistance and rigidity in addition to good chemical resistance, dimensional stability and heat resistance are featured.

It has thus been increasingly used for auto parts, electronic and electronical equipment to replace metals and other plastics. In Japan "Fortron" compound has been produced and marketed by Polyplastics Co., a Japanese joint venture between Daicel of Japan and Hoechst Celanese, and in the U.S. and Europe, by Hoechst Celanese and Hoechst, respectively.

The new Fortron project means that the Hoechst group's efforts to exploit the Western markets for Fortron has been going well, producing increasing demand. Under the agreement, Kureha will provide the new firm with Fortron production know-how while the Hoechst group will offer Fortron compound-production know-how as well as market the product. Hoechst will also sell the compound in Far East excluding Japan.

Kureha and Hoechst appear to be considering doubling the compound capacity in the U.S. during the latter half of the 1990s depending on how the market moves. The U.S. Fortron resin plant, when completed, will bring Kureha's comnbined PPS capacity to 6,600 t/y.

OIL CONSUMPTION INCREASES REMARKABLY IN PACIFIC REGION

According to an oil-industry source, it is now known that oil consumption in the Pacific region, including Asia and Oceania, was 13,400,000 barrels per day in 1991. The amount is 6.2% more than that recorded in the preceding year.

This means that the Pacific region has grown into the world's 2nd-biggest oil market, after North America. Consump-

tion in Japan amounts to about four million barrels per day, accounting for a little more than 10% of the total amount of global consumption. Oil consumption in Asia and the Pacific region including Japan accounts for a little more than 30% of total world consumption. It is expected that oil consumption in Asia and the Pacific region will continue to increase hereafter, to amount to 16,00,000 barrels in 1995 and 18,600,000 barrels in 2000.

On the other hand, the results of the surveys conducted by the Oil League and other organisations on the demand and supply of crude oil in Asia and the Pacific region indicate that such countries as Indonesia and China, which presently are exporting crude oil will become importers of crude oil in the true sense of the word by 2000. So, it is expected that the dependence of Asia and the Pacific region on the supply of crude oil from the Middle East will increase further hereafter. During the past several years, oil consumption in Asia and the Pacific region has continued to record almost double-digit increases, with the economic growth of such newly risen industrial nations as ROK, Taiwan and Singapore in the background.

In addition, consumption in such countries as Malaysia, Thailand and China is increasing. From the medium- and long-range points of view as well, therefore, it is expected that oil consumption will remain at a high level hereafter. Consumption in Japan amounts to about four million barrels per day, accounting for a little more than 10% of total world consumption. Oil consumption in Asia and the Pacific region, including Japan, account for a little more than 30% of the total global consumption.

PETROCHEMICAL PRODUCTION CUT SEEN FOR SOUTH KOREA

S. Korean petrochemical companies are scheduled to conduct repairs on their manufacturing plants for 40-45 days —longer than is usual — from April thru September: the plants were those started up within the last two years. It is widely believed that their moves are mostly intended to cut down on production, thereby reducing the oversupply of petrochemical products stemming from successive startups of new plants last year. Yukong — a forerunner petrochemical maker in the country — plans to conduct plant repairs in mid-April, followed by Daelim Industrial Co., Korea Petrochemical Industrial Co. (early in May in each case), Lucky and Samsung General Chemical Co. (in mid-Sept. in both cases). Hyundai Petrochemical Co. has yet to disclose its plant-repair plan. In S. Korea, the plant-operation rate for ethylene is rising along with inauguration of related derivatives plants. Production has, however, exceeded domestic demand by a large margin and, as a result, major derivatives including polyethylene are flooding the Chinese and Southeast Asian markets.

New Developments from Japan

HERBICIDE UTILISING NATURALLY OCCURRING GERM VERY EFFECTIVE

Mitsui Toatsu Chemicals, Inc. is close to the development of a new-type herbicide utilising a microbe occurring in nature. The herbicide is said to completely destroy barnyard grass, a difficult-to-kill grass in paddy fields.

The bacterium concerned belongs to the Drechslera species and is a pathogenic mold. It is parasitic specifically on barnyard grass and acts to kill it. The firm discovered the germ after examining about 6,000 species. The company says evaluation tests show that application of the germ in the amount of 0.1-1.0 gram of conidia (spores) per acre completely prevented the growth of barnyard grass in paddy fields and produced no harmful effect on the rice because the germ is highly specifically active against the target grass. The firm is now compiling data regarding the new herbicide to prepare for production application, while it will continue research and tests to commercialise the new chemical in the near future. Mitsui Toatsu Chemicals intends to single out and refine what it thinks are the most active strains of the Drechslera species and formulate its spores as an effective ingredient. The strain will be mass-produced by means of fermentation. The firm adds that the chemical containing the germ spores in question is also very effective when used in combination with other herbicides.

CHOLESTEROL PREVENTED FROM ADHERING TO BLOOD VESSELS

Kyowa Hakko Kogyo Co. has succeeded in synthesising a dibenzoxepin derivative (KF-17828), which, the company claims, serves as an inhibitor for Acyl-CoA/cholesterol acyltransferase (ACAT) capable of producing cholesterol ester. Cholesterol adheres to blood vessels and is absorbed through the intestines, both in the form of cholesterol ester. It is, therefore, possible to prevent these phenomena by inhibiting the ACAT function.

Animal tests on the new product have confirmed that it is capable of efficiently inhibiting ACAT and lowering the cholesterol level in blood. For example, when KF-17828 was given to a rabbit which took cholesterol-added-feed, the laboratory animal did not suffer from arterio-sclerosis, denoting that the product prevented the cholesterol from being absorbed into the animal's blood vessels. Kyowa Hakko has synthesised various types of dibenzoxepin derivatives from carboxylic acid and aniline and picked out the said product, —2-bromo-N-(2,6-diisopropyl-phenyl)-6, 11-dihydrodibenz (b,e) oxepin-11-carboxamide.

ACAT inhibitors are now under development or have been put into clinical trials by a few companies both at home and overseas. Kyowa Hakko is considering pioneering KF-17828-applied cures for arterio-sclerosis and hyperlipemia.

FAR LOWER-PRICED CAR-USE CATALYST BARED BY MITSUI

Mitsui Mining & Smelting Co. has developed a far lower-priced catalyst for car-exhaust treatment and begun its sample shipments. Using palladium as a precious metal instead of the platinum and rhodium employed for car catalysts, the cost of the new catalyst can be reduced to one-third to one-fourth that of conventional ones, the company claims.

The firm says that the catalyst, when used in combination with an improved version of electronically controlled fuel injectors, is capable of treating exhaust gas to an extent comparable with that in the case of using conventional platinum- or rhodium-used catalysts. For the time being the company is considering applying the catalyst to Japanese-made commercial-use vehicles for which exhaust-gas controls are not so strict as those over other types of vehicles. The company will continue research and tests on the catalyst so that it can be commercially applied to other types of vehicles within a year. Existing car catalysts adopt expensive platinum or rhodium to convert NO_x CO and hydrocarbons into harmless substances. These precious metals — rhodium in particular is rare — are expensive and research on their alternatives has been under way throughout the world. Palladium is a low-priced element belonging to the platinum group and has been regarded as the most promising alternative. It has, however, problems with regard to activity and durability as a catalyst. Mitsui's success mainly stems from the modification of a fuel injector facilitating use of palladium.

UV-PERMEATING ADHESIVE EXTREMELY LIGHT RESISTANT

Adel Corp. — a venture business handling adhesives for optoelectronic applications — has developed a light-resistant adhesive for optical use. The new product is based on a special acrylic resin and is cured when exposed to ultraviolet (UV) rays. It never absorbs the UV rays and instead allows all of them to permeate itself. As a result, it is not deteriorated by the UV rays and is capable of maintaining the desired effect for a long time. The product is completely different from conventional ones in that a UV-absorbing agent is added to the latter and the resultant products prevent UV rays from permeating themselves and thus show light resistance: the agent absorbs UV rays and radiates relevent energy in the form of thermal energy. Conventional products sometimes deteriorate when exposed to UV rays for a long time but the new product is completely free from such a defect.

The product also has good water resistance and such low viscosity that it facilitates precision bonding of target materials. Its potential applications are laminated glass (window glass and outdoor display), optical filters and repairs on cracked glass.

HEAT-REVERSIBLE INFO-RECORDING FILM BARED

Ricoh Co. has pioneered heat-reversible information-recording film, on which high-resolution letters can be repeatedly printed and erased therefrom. Letters are printed in white on the film using a thermal head (90-100°C) and the film turns transparent when heated up to 65-90°C by means of a heated roller. The company claims that the letters printed will remain semipermanently in a steady state and can be repeatedly recorded/erased about 500 times. The film is based on transparent PET film, on which a mixture of synthetic resin and organic low-molecular material (higher fatty acid) having a particle diameter of less than 1 micron is coated as a recording layer. When the higher fatty-acid particles form large-sized single crystals, the film is transparent because light is not scattered thereupon. When they form polycrystals, incident light is repeatedly refracted and the letters printed appear white.

The new product has good potential for use in cards on which information (dates, numbers and money balances, etc.) can be recorded and tags for machinery parts and production items both related to factory automation, etc.

NEW WATER-BASED PAINT RESIN MADE FROM POLYHYDRIC ALCOHOL

Koei Chemical Co. has developed a water-soluble paint-use resin utilising pentaerythritol, a derivative of polyhydric alcohol and will commercialise it within the year. The firm will also boost operations for its synthetic lubricant material, another derivative of polyhydric alcohol, used as a coolant to replace a specific CFC. The firm says these operations will help to achieve the goals set by its medium-range plan aimed at attaining annual sales of ¥29 billion ($117 million) and increasing the share of ordinary profits in its total sales to more than 7% for 1994, the final year of the plan. The polyhydric alcohol-related business mirrors the firm's policy of stressing business involved in environmental protection in order to achieve expansion. The new paint-use resin features high affinity with water because of the carbonic acid contained, and is uniform and has a good adhesion property, serving as a good carrier of paints. In Japan, water-based paints have not been commercially applied to cars unlike in the West, but it is said that Koei resin has been used on a trial basis on Japanese car models and produced good results from the technical view point.

MARKET INFORMATION

Market subdued

There was a rumour afloat in the Chemicals Market, that the Maharashtra Government is likely to increase the sales tax to 10% from the present 4% resulting in reduction in sales turnover. Many major transactions were pending. The arrival of refined naphthalene has brought down the price to Rs. 31.50 from Rs. 38/-. The better availbility marked down the rate of H. acid slightly. H.O.C. has reduced the price of PNCB by Rs. 4/-. There were some reductions in the prices of beta naphthol and its allied products.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on May 6, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.00
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	4.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	102.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	5.00
Borax (Granular)	35.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	85.00
Butyl carbitol	110.00
Caustic soda (Flakes)	18.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	6,400.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	195.00

Hydro	58.00
Hyflosupercell	42.00
Hexamine (Resale)	34.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	60.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	210.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	42.00
Phthalic anhydride (Resale)	42.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	95.00
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	70.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	115+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	16.50
Acetic Anhydride (Resale)	34.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	65.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	115.00
Chloroform	65.00
Carbon Tetrachloride	27.00
Cellosolve	70.00
Cyclohexanone	80.00
Cyclohexanol	85+ST
Diacetone (Resale)	29.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG) (Resale)	48.00
Dioctyl Phthalate	69.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	24.00
Ethyl Acrylate	92.00
Ethylene Dichloride	21.00
Ethylene Glycol	32.00
Formic Acid (Imp.)	34.00
Formaldehyde (Resale)	7.75
Glycerine (CP)	70.00
Glycerine (IW)	65.00
Hydrogen Peroxide 50% (Resale)	45.00
Isopropyl Alcohol	42.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	115.00
Melamine	62.00
Methyl Ethyl Ketone	60.00
Methyl Isobutyl Ketone	60.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	30.00

Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	66.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	17.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.50
Xylene (Ortho)	25.50

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	92.00
Alpha Naphthol (Imp.)	230.00
Aceto Acetic Ester (Methyl)	155.00
Acetanilide	62.00
Anthraquinone	135.00
Anthranilic Acid	115.00
2-Amino 4-Nitrophenol	160.00
Blue B. Base (Local)	330.00
Beta Naphthol	78.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid (IDI)	650.00
BON Acid	130.00
CPC (Crude)	115.00
Chicago Acid (Atul)	350.00
Coach Acid	68.00
Cyanuric Chloride (German)	258.00
DEMAP	275.00
2,4-DNCB	35.00
Dichlone (Imp.)	450.00
Dimethyl Aniline	85.00
Diethyl Aniline	145.00
Diethyl Sulphate (Japan)	93.00
Diethyl Sulphate (Local)	80.00
Diamino stilbene disulphonic acid	210.00
3,3-DCB	260.00
Diphenylamine (U.K.)	155.00
Gamma Acid (Atul)	225.00
Gamma Acid (Local)	175.00
H. Acid (Atul)	160.00
G. Salt	82.00
J. Acid	375.00
K. Acid	125.0
MPDS (Local)	155.0
MNA	130.0
Meta Ureido Aniline	190.0
MPD (Local)	175.0
MPD (German)	210.0
N-Methyl J. Acid	515.0
N-Methyl Aniline	125.0
Naphthalene (Refined)	31.5
Ortho Anisidine (OA) (Imp.)	110.0
Ortho Dichloro Benzene (ODCB)	20.0
OT Base	170.0
OT Liquid	75.0
Para Dichloro Benzene (PDCB)	33.0
Para Anisidine (PA local)	160.0
PNA	95.0
Para Cresidine (Imp.)	330.0
Para Amino Azo Benzene (India)	135.0
PNCB (HOC)	54.0
Para Nitro Toluene	90.0
1-Phenyl 3-Methyl 5-Pyrazolone	175.00
Phenyl J. Acid	415.00
PT Base	165.00
Rhoduline Acid	600.00
Resist Salt 80%	26.00
Resorcinol	350.00
Sodium Naphthionate	85.00
5-Sulpho-Anthranilic Acid	115.00
Sulphanilic Acid	35.00
Sulpho Tobias Acid	155.00
Tobias Acid (Imp.)	115.00
Metanilic Acid	48.00
MTD (German)	185.00
Vinyl Sulphone	125.00

Bombay Drugs Market

(Prices as on May 6, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	565
Aluminium Hydroxide IP	43
Ampicillin Sodium	4300
Ampicillin Trihydrate	3250
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2700
Analgin	360
Aspirin IP	105
Atenolol	2450
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Butylated Hydroxy Anisole	1400
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	260
Calcium Lactate	30
Calcium D Pantothenate	1550
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2950
Chlorpropamide	230
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3200
Cimetidine	3350
Citric Acid IP	110
C.P. Maleate	1175
Cyproheptadine HCl	27000
D-Panthenol	2000
Diclofenac Sodium	2500
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	710
Diloxanide Furoate IP	500
Diphenhydramine HCl	365
Disodium Hydrogen Citrate	120
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	575
Ethyl Oleate	180
Fenbendazole	2700
Ferrous Fumarate	52
Ferrous Gluconate	135
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	800
Glyceryl Glycol Ether	620
Griseofulvin	2100
Guanidine Nitrate	51
Gallic Acid	475
Hydrazine Hydrate	120
Hydroxylamine HCl	600
Hydroxylamine Sulphate	115
Ibuprofen IP	480
Imipramine HCl	5000
Indomethazine	1150
I.N.H.	375
Inositol IP	1600
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	115
Lactic Acid (Japan)	165
Levamisole	2000
Lignocaine HCl	450
Lignocaine Base	450
Loperamide	3300
L. Lysine Feed Grade	170
L. Lysine Pharma Grade	280
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	325
Mebendazole IP	575
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	425
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	580
Metronidazole Benzoate	525
Morpholine	175
Neomycine Sulphate	4300
Niacin	300
Niacinamide	400
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4600
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	150
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1500
Pheniramine Maleate	1475
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1860
Phthalyl Sulphathiazole	450
Piperazine Citrate	380
Piperazine Hexahydrate	175
Prochlorperazine Maleate	8600
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2100
Pyremethamine	2100
Pyroxicam	3200
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	250
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	860
Sulphacetamide Sodium	380

Product	Rs./kg.
Sulphadoxine	3000
Sulphamethoxazole	390
Sulphasomidine	475
Sulphaphenazole	325
Terbutaline Sulphate	30000
Tinidazole	480
Theophylline Anhydrous	415
Thiacetazone	325
Thoridazine HCl	18000
Thycol (Potassium Gluconate Sulphate)	500
Tolbutamide	225
Trifluopromazine HCl	11500
Trifluoperazine HCl	13000
Trimethoprim IP	1875
Tween 80	275
Vitamin B6 Hydrochloride	2900
Vitamin B2 5-Phosphate	5000
Vitamin K-3 (Water soluble)	750

EXPORT C.I.F. PRICES FOR BULK DRUGS FROM INDIA
(Prices in US$)

Ampicillin Trihydrate B.P.	75.00
Amoxycillin Trihydrate B.P.	78.00
Cephalexine B.P.	175.00
Chlorpropamide HCl	7.50
Chlorbutol B.P.	6.50
Chloramphenicol Powder B.P.	56.00
Chloramphenicol Palmitate	53.00
Chlorpheniramine Maleate B.P.	36.00
Dimetridazole	10.00
Ethambutol HCl B.P.	36.00
Erythromycin Stearate B.P.	65.00
Erythromycin Estolate B.P.	70.00
Erythromycin Base B.P.	85.00
Erythromycin Base USP	80.00
Furosemide B.P.	58.00
Ferrous Fumarate USP XXI	1.60
I.N.H.	8.75
Iodochlorohydoxyquinoline USP XXI	18.50
Ibuprofen B.P.	13.00
2-Methyl 5-Nitro Imidazole	7.50
Mebendazole USP XXI	22.00
Metochlopramide HCl	65.00
Nifedipine USP XXI	47.00
Niacinamide B.P.	8.00
Niacin B.P.	7.50
Ortho Nitro Benzaldehyde	48.00
Oxyphenbutazone B.P.	23.00
Pheniramine Maleate B.P.	45.00
Potassium Iodide B.P.	11.00
Phenolphthalein B.P./USP/White	10.50
Pyrazinamide B.P.	36.00
Paracetamol B.P.	4.70
Pyroxicam USP XXI	95.00
Riboflavin Sodium Phosphate USP XXI	95.00
Salbutamol Sulphate B.P.	240.00
Sodium Iodide B.P.	13.00
Sulphamethoxazole	11.00
Tinidazole B.P.	15.00
Tolbutamide	8.00
Trimethoprim B.P.	33.00
Thiacetazone	13.00

Bombay Dyes Market

(Prices as on May 6, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Crains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: MAY 1 (NNS) Following blast in the densely populated area of Naya Bazar on 29th April, 1992, leaving many persons dead, apart from loss of property worth crores of rupees, activity in the local chemicals market during the week was reported at a low ebb. Market remained closed for two days in a week in sympathy with the bereaved families. Following satisfactory supply position coupled with lack of follow-up support from local as well as upcountry buyers, most of the chemical items exhibited a declining tendency. On improvement in supply of citric acid China coupled with inflow of citric acid Bombay Dyeing and due to weak follow-up support, citric acid, slumped by Rs. 100/400 at Rs. 5800/6000 per 50 kg. Similarly, in the absence of demand caustic soda flakes ended the week with a moderate loss of Rs. 10 at Rs. 840/850 per 50 kg. Chatkolite and safolite slipped to Rs. 82 and Rs. 76 from Rs. 87 and Rs. 78 per kg. respectively due to lack of support from gur manufacturers.

On arrivals of small quantities of rangolite Germany, it was quoted at Rs. 120 per kg. Following reduction in prices by the company sodium nitrite suffered a setback of Rs. 25/50 at Rs. 725/800 per 50 kg. In the absence of support from consuming areas, menthol flake eased slightly by Rs. one at Rs. 232 per kg. Hydrogen peroxide remained subdued at its last week closing of Rs. 44.50/45 per kg. Due to lack of buying support, slack wax ended the week, with a loss of Rs. 100 at Rs. 13,000 per tonne. Similarly, borax granular slumped by Rs. 25 at Rs. 1775 per 50 kg. For want of enquiries, tartaric acid France slipped by Rs. 4 at Rs. 512 per kg. Due to lack of follow up support from paint and plastic manufacturers, titanium dioxide RC-822 came down to Rs. 94 from Rs. 96 per kg. In a lack-lustre trading, no change was recorded in other chemical items and prices hovered around at their last week closing. Due to lack of follow-up support from local as well as up-country buyers, no spectacular change was recorded in dyes and colour.

(DELHI MARKET RATES AS ON MAY 1, 1992)

Ammonia Bicarb (Per 25 Kg.)	180.00
Mercury (Per flask)	7,300.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	840/850.00
Citric acid (Per 50 Kg.)	5,800/6,000.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCl (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	415/425.00
Sod. Hydrosulphite (Per Kg.)	54.00/64.50
Rangolite (Per Kg.)	120.00
Safolite (Per Kg.)	82.00
Chatkolite (Per Kg.)	76.00
Decolite (Per Kg.)	85.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,900.00
Paraffin Wax (Per 50 Kg.)	1,150.00
Slack wax (Per metric tonne)	13,000.00
Tartaric Acid (France Per Kg.)	512.00
Borax Granular (Per 50 Kg.)	1,775.00
Borax Crystal (Per 50 Kg.)	1,900.00
Sodium Nitrite (Per 50 Kg.)	725/800.00
Sodium Nitrate (Per 50 Kg.)	525.00
Camphor Thal (Per Kg.)	140.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	265.00
Menthol Medium (Per Kg.)	250.00
Menthol Flake (Per Kg.)	232.00
Menthol Flake Diwali delivery (Per Kg.)	N.A.
Menthol Oil (Per Kg.)	160.00
Glycerine (Per Kg.)	65.00/70,00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.00
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/41.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	44.50/45.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (50 Kg.)	625/630.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	65.00
Titanium Dioxide RC-822 (Per Kg.)	94.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	62.00
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	57.00/67.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	31.75/32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,150
Match Wax	18,000.00
Residue Wax	7,600.00
Decolite	96.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	150/171.75
Naphthol ASG	300/316.69
Naphthol ASBS	250/303.07
Naphthol ASTR	350/461.64
Naphthol ASOL	200/239.88
Naphthol ASBO	260/319.17

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/237.86
Diazo Black B.T.	115/197.26
Green B	100/192.61
Blue 2-B	70/138.86
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/317.07
Basic Auramine	55/115.00
Basic Rhodamine	340/450.00
Basic Methylene Blue	100/210.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/145.76
Congo Red H/C	95/168.56

Madras Market

Most prices remained stable. There has been further spurt in the prices of citric acid due to good demand. Petrochemical solvent supply position continues to be bad. Products like IPA, MIBK, PEG were under short supply. There has been a marginal drop in caustic soda flakes prices due to better availability. Similarly, prices of chloromethanes have eased on better availability.

(MADRAS MARKET RATES AS ON MAY 2, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.50
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	42.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per 50 kgs)	310.00
Borax (per 50 kgs)	1,800.00
Boric Acid (per 50 kgs)	3,200.00
Calcium Chloride Solid (per kg)	4.50
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	8.00
Calcium Carbonate (Precipitated) (per kg)	6.75
Caustic Soda Flakes (per kg)	18.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	40.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.00
Ferrous Sulphate Crystal (per kg)	10.00
Hydros (TCPL) (per kg)	57.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	43.00
Hyflosupercell (per kg)	43.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	30.00
Magnesium Chloride (per kg)	6.00
Magnesium Sulphate (per kg)	5.50
Mercury (per 34.5 kgs)	8,600.00
Nickel Chloride (per kg)	210.00
Nickel Sulphate (per kg)	210.00
Phosphoric Acid (per kg)	35.00
Potassium Carbonate (per kg)	35.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	525.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	12.00
Sodium Sulphite (per kg)	14.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	6.00
Sodium Sulphide (per kg)	18.00
Sodium Hexameta Phosphate (per kg)	28.00
Sodium Tripolyphosphate (per kg)	29.00
Trisodium Phosphate (per kg)	16.00
Titanium Dioxide (Anatase) (per kg)	67.00
Titanium Dioxide (Rutile) (per kg)	100.00
Zinc Chloride (per kg)	20.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	16.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	36.00
Acetic Acid (per kg)	22.00
Acid Slurry (per kg)	36.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	130.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	68.00
Glue Flakes (per kg)	18.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	400.00
Oxalic Acid (per kg)	18.00
Pentaerythritol (per kg)	66.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	210.00
Phthalic Anhydride (per kg)	46.00
Sodium Acetate (per kg)	14.00
Sodium Alginate (per kg)	275.00
Sorbitol (per kg)	27.00
Urea (Technical) (per kg)	4.00

SOLVENTS

Acetone -- HOCL (per kg)	30.00
Benzene (per litre)	22.50
Butanol (per kg)	60.00
Butyl Acetate (per kg)	58.00
Carbon Tetra Chloride (per kg)	30.00
Cellosolve (per kg)	80.00
Chloroform (per kg)	35.00
Diacetone Alcohol (per kg)	44.00
Diethylene Glycol (per kg)	50.00
Di-butyl Phthalate (per kg)	66.00
Di-octyl Phthalate (per kg)	56.00
Ethyl Acetate (per kg)	27.00
Isopropyl Alcohol (per kg)	45.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	27.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	60.00
Octanol (per kg)	80.00
PEG 400 (per kg)	70.00
Perchloroethylene (per kg)	40.00
Propylene Glycol (per kg)	66.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	37.00
Toluene (per kg)	24.00
Xylene (per kg)	32.00

CALCUTTA MARKET
(Prices as on May 3, 1992)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	2,750.00
Camphor (per kg)	92-94.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	800.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	285.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Dyestuffs

The Tianjin Dyestuff No. 4 Chemical Plant of China offers the following dyestuffs:

Product	FOB Tianjin Price (US$/tonne)
Methylene blue 2B	8,950
Basic brilliant blue BO	19,400
Basic Brilliant Blue B	11,190
Basic Orange	3,580

The packing is in 25-kg, plastic lined iron drum. Established in 1949, the plant has 550 employees and a paid-up capital of US$ 1.3 million. It exports about 400 tonnes of dyestuffs per year. For further information, contact: Bai Ruiqing, Tianjin Dyestuff Chemical No. 4 Plant, 29 Xin Xin Road, Hexi District, Tianjin, China. Tel: (8622) 701344; Fax: (8622) 310502; Cable: 4346.

The Tianjin Dyestuff Chemical Plant of China offers the following dyestuffs:

Product	FOB Tianjin Price (US$/tonne)
Reactive black KNB	5,100
Disperse blue HGL	4,200
Disperse black S-2BL	4,650
Fluorescent brightening agent VBL	4,100

The packing is in 25-kg, plastic-lined iron drums. Established in 1937, the plant has 1,300 employees and a fixed capital of US$ 4.1 million. It exports about 300 tonnes of dyestuffs per year. For further information, contact: Sui Weizhang, Manager, Tinanjin Dyestuff Chemical Plant, 9 Nan-Bei Street, Yang Zhuang Zi, Hexi District, Tianjin, China. Tel: (8622) 802397; Fax: (8622) 310502; Cable: 4442.

Sodium silicate

A Zimbabwean firm, Chemical Enterprises Ltd., engaged in the manufacture of chemicals offers sodium silicate. The product is used for quick setting of impervious cement or as a surface hardener. It is packed in 5-litre tin cans, priced locally at US$ 10 each. Export price and other terms of trade will be negotiated directly with interested parties. Established in 1964, the firm has 28 employees and an annual turnover of US$ 800,000. For more information, contact: Charles Roberts, Managing Director, Chemical Enterprises Pvt. Ltd., P.O. Box 1928, Harare, Zimbabwe. Tel: (2634) 730135, 63403; Fax: (2634) 63403.

Phosphoric acid

A Philippine company offers techical grade phosphoric acid in bulk. It is suitable for use in the manufacture of soaps, detergents, inorganic phosphates and fertilisers. The product, from Philippine Phosphate Fertilizer Corporation, has a density of 1.7 t/m^2 at 15°C. It has the following percentage composition:

Phosphoric anhydride (P_2O_5)	: 52-54
Calcium oxide	: 0.2
Magnesium oxide	: 1 max.
Ferric oxide and aluminium oxide	: 0.5-1.5
Fluorine	: 0.36 max

The company can supply upto 20,000 tonnes per month. Price varies depending on the order volume. Delivery schedule is 45 days from receipt of letter of credit. Port of shipment is Leyte.

Established in 1980, the company has 1,800 employees. Its annual turnover is US$ 150 million, including exports to Indonesia, Malaysia, Thailand and Vietnam. For more information, contact: Fáusitino Almendral, Export Sales Department, Philippine Phosphate Fertilizer Corporation, 4/F, Low Rise Section, Pacific Star Building, Dil Puyat Avenue Corner, Makati Avenue, Makati, Metro Manila, Philippines. Tel: (632) 8174096, 8172981-3, 8173131-3; Telex: (752) 23254 PHILPHOS (756) 64473 PSPATE PN.

Acrylic resin

A Mexican company, Dale Quimica S.A., offers an acrylic resin, suitable for use in the manufacture of adhesives and aqueous sealants. "DALECRIL-CS" is thermoplastic polymer with a high-solid content. It is claimed to have excellent flexibility and pigment compatibility, and to be highly resistant to ultraviolet light. The resin has the following specifications - Density (25°C): 1.070 g/cm^3; viscosity: 1,500 CP; pH: 4; solid content: 55 (+/- 0.5 per cent).

It is packed in 200-kg metal or plastic drums, and is priced at US$1,650 per tonne. Minimum order is one tonne. Established in 1975, the firm is engaged in the manufacture of industrial chemical products. It has 120 employees and an annual turnover of US$ 6.5 million. For more information, contact: David Diaz Gerente de Ventas, Dale Quimica S.A., Mariano Azuela 41-A, Circuito Novelistas, Ciudad Satelite 53100 Naucalpan, Edo de Mexico, Mexico. Tel:(525) 562 1262; 572 8280; Fax: (525) 562 6914; Tlx: (22) 172393 DALA ME.

Phosphoric acid

Productora Andina de Acidos Y Derivados, Transversal 6 No. 14-60, Entrada 1, Cazuca, P.O. Box 8598, Santafe de Bogota, D.C., Colombia. Tel: 571-7767866; Fax: 571-7756400; Telex: 42363 PAAD CO.

Fertilizers; Fungicides

BASF Venezolana S.A., Attention: Roberto Diaz, Edf. BASF-C/Milan, Los Ruices Sur, Caracas 1071, Venezuela. Tel: 2560011; Fax: 2563379; Telex: 25143 VC.

Bayer de Venezuela S.A., Avenida Tamanaco, Torre Bayer, El Rosal, Caracas, Venezuela. Tel: 2-9052111, 2-9052320; Fax: 2-9514825; Telex: 27695.

Fertilizers

Eastern Europe Inc., Attention: Dr. Robert Ross; 460 West, 34th Street, 12th Floor, New York, NY 10001, United States. Tel: 212-9478585.

Vencatalyst C.A., Avenida Principal Los Chorros, Edf. Ozalid, Piso 1°, Ofc. 1-A, Los Dos Caminos, Caracas, Venezuela. Tel: 2-361793, 2-354448; Fax: 2-2839175.

Pigment (perlicized and iridiscent)

Permaquim Ltda., Calle 73 No. 10-10, Ofc. 512, P.O. Box: 47697, Santafe de Bogota, D.C., Colombia. Tel: 2176578; Fax: 2552843.

Fungicides

Lucta Grancolombiana Ltda., Calle 164 No. 42-40, P.O. Box: 101586, Santafe de Bogota, D.C., Colombia., Tel: 1-6712200; Fax: 1-6714813; Telex: 45745 LUCTA.

Hoechst de Venezuela C.A., Urbanizacion La Trinidad, Calle Las Vegas, Edf. Hoechst, Caracas, Venezuela. Tel: 2-933333; Fax: 2-933589.

Monsanto Venezuela C.A., Ave. Francisco Miranda, Edf. Parque Cristal, Torre Este, Piso 8°, Ofc. 8-12, Caracas, Venezuela. Tel: 2-2841184, 2-2842595; Fax: 2-2846214.

Pesticidas Nacionales Comanil C.A., Avenida Libertador C/C La Joya, Edf. Unidad Technica del Este, Piso 2°, Ofc. 4, Chacao, Caracas, Venezuela. Tel: 2-323994, 3-327907.

Herbicides; fertilizers

Du Pont de Venezuela C.A., Calle La Guarita, Edf. Los Failes, Piso 1, Chuao, Caracas, Venezuela. Tel: 2-926022; Fax: 2-929442.

Herbicides

Shell Quimica de Venezuela C.A., Avenida La Estancia, Centro Banaven, Torre C, Piso 7°, Chuao, Caracas, Venezuela. Tel: 2-916777, 2-925522; Fax: 2-924591; Telex: 25496.

Polypropylene; crystal polystyrene

Andesia Ltda., Carrera 8A, No. 99-51, Ofc. 405, P.O. Box. 90464, Santafe de Bogota, D.C., Colombia. Fax: 2183675; Telex: 44656 ANDEA CO.

Polypropylene

Polipropileno del Caribe S.A., Carrera 10° No. 28-49, Piso 27, P.O. Box: 130, Santafe de Bogota, D.C., Colombia. Tel: 571-2863111; Fax: 571-2820263.

Titanium dioxide

Philico Trading Co. Ltd., Philico B/D, 1063-12, Hwakok-dong, Kangso-ku, Seoul, South Korea. Tel: 02-6977866; Fax: 02-6977563; Telex: PHILICO K 28468.

Zinc oxide

Prodimpex Domino S.R.L., P.O. Box: 15-23, Bucarest, Rumania. Tel: 400-724045; Fax: 400-102939.

Calcium carbide

Colombiana de Carburo y Derivados S.A., Transversal 14A No. 114-25, P.O. Box: 91255, Santafe de Bogota, D.C., Colombia. Tel: 2133843, 6200172; Fax: 2130132.

Maleic anhydride

Anhidridos de Venezuela C.A., Attention: Saverio Leggio C., Avenida Venezuela, Edf. Torre Oxal P.H. 2, Urbanizacion El Rosal, P.O. Box: 52035, Caracas, Venezuela. Tel: 9514907, 9515445; Fax: 9515665; Telex: 21117.

Titanium oxide based pigments

Philaac, Calle 21 No. 68A-98, P.O. Box: 19510; Santafe de Bogota, D.C., Colombia. Tel: 1-2920711, 2920745; Fax: 1-2926675; Telex: 42259 PILAC CO.

Polyethylene (high and low density)

BASF Venezolana S.A., Attention: Roberto Diaz, Ave. Principal de Marac acuay, Multicentro Macaracuay, Piso 10°, Caracas 1071, Venezuela. Tel 2560011; Fax: 2563379; Telex: 2514 VC.

Polietileno San Martin C.A., Segunda Calle, Urbanizacion Las Fuentes Quinta Cumboto, El Paraiso, Caracas Venezuela. Tel: 2-4617663.

Rete Plast C.A., Carretera Panamericana Kmt. 14, Las Minas entrada, Los Llaneros, Caracas, Venezuela. Tel: 32-710174.

Polimeros del Lago C.A., Avenida Francisco de Miranda, Torre Bazar Bolivar, Piso 11, Caracas, Venezuela. Tel: 2-399696; Fax: 2-2395717.

Association de Fabricantes de Productos Quimicos, Avenida Francisco Solano Lopez, Chacaito Centro Solano, Piso 1°, Ofc. 1-A, Caracas 1050, Venezuela. Tel: 2-725485, 2-725104; Fax: 2-720597; Telex: 28574.

Polyvinyl chloride

Colombiana de Carburo y Derivados S.A., Transversal 14A No. 114-25, P.O. Box 91255, Santafe de Bogota, D.C., Colombia. Tel: 2133843, 6200172; Telex: 2130132.

Plasticized polyvinyl chloride

Prodimpex Domino S.R.L., P.O. Box: 15-25, Bucarest, Rumania. Tel: 400-724045; Fax: 400-102939.

EXPORT OPPORTUNITIES

Gypsum (SO_3 t 40%, SO_3 $2H_2O$ at 86%; humidity (45.6.c): Maximum 5%; the material shall be in powder or in blocks upto 30 cm.

Jarrin & Asociados, Ov iedo y Bolivar (Esquina), Edf. Mutualsta Imbabura, Ibarra, Ecuador. Tel: 952224; Fax: 954468.

Feldspar; chloroform

Allied Signal Inc., Attention: Edward C. Calamari, Gerente de Planta, Lupine

·venida & Ontario Street, P.O. Box: ·830, Baton Rouge, LA 70821, United ·tates. Tel: 504-3835222; Fax: 504-·463612.

Gypsum

Precast Engineering, Avenida Madgalena 1303, Suite 7 A Condado, Santruce, PR 00907, Puerto Rico. Fax: 7215613.

Red Mercury

Traders of Bulgaria, 63, Boriugrad Street, Suite 2, Stara Zagora 6000, Bulgaria. Fax: 359-4222501.

Sodium silicate, crystal, neutral or semi-neutral, packed in bags

Fabrica de Jabones Patria S.A., C. Batallon Colorados No. 42, P.O. Box 510, La Pauz, Bolivia. Tel: 02-365963, 02-813151; Fax: 02-353534; Telex: 3310 PATRIA BV.

Formic acid

Tradinter S.R.L., Attention: Pablo Sigwald, Carlos Pellegrini 1175, Piso 2, 1009, Buenos Aires, Argentina. Tel: 541-3224233, 541-3228322; Fax: 541-112796; Telex: 23851.

Lyophilized albumin

Equus Products Inc., 81, Rue des Pecheries Bte, 18, 1170, Bruselas, Belgium. Tel: 322-6730551; Fax: 322-6605981.

Pharmaceutical goods, urea

Albahr Trading Co., P.O. Box 3356, Taiz, Arab Republic of Yemen. Telex: 8839.

Titanium dioxide based pigments

Estuplas Ltda., Carrera 63 No. 16-10, P.O. Box: 001191, Santafe de Bogota, D.C., Colombia. Tel: 2618466; Fax: 2615401.

Alcohol

The Egyptian Sugar Distillery Company invites bids for the supply of 1,500 tonnes of alcohol (96%). A bid bond of US$ 10,000 is required. Bid date to be announced. Both offer and bid bond should be valid for one month. Detailed specifications and terms of trade are available in bid documents, which can be obtained for 250 Egyptian Pounds. Established in 1956, the company has 25,000 employees.

For further information, contact: The Chairman, Sales and Export Sector, Egyptian Sugar Distillery Company, P.O. Box 763, Cairo, 12, Gaward Housni Street, Cairo, Egypt. Tel: (202) 3929077, 3929138; Telex: (91) 92015 SDE IN, 20906 SDE IN.

MISCELLANEOUS

Consultancy in Chemicals

A Brazilian research institute offers consultancy and technical assitance in rubber and plastics sectors. The services offered by the Polymer Chemistry and Technology Unit of the National Technology Institute (INT), cover the following areas: (1) Research and development of organic semiconducting polymers, methods of plastics recuperation and component substitution in polymers; (2) Technology applications in heating control in raw material processing, polymer formulations, evaluation and characterization of samples, optimizing operating conditions, and testing according to national and international standards; (3) Training technicians for micro, small and medium enterprises.

The unit has laboratories for mechanical testing, chemical analyses and semi-industrial scale testing. Established in 1934, it has 350 employees. Fees depend on the type and extents of services required.

For further information, contact: Unidad de Quimica e Technologia de Polimeros Instituto Nacional de Tecnologia (INT), Av. Venezuela 82, 20081, Rio de Janeiro, Brazil. Tel: (5521) 253 4043, Telex: (38) 2130056 FINT BR.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Hindustan Copper Ltd. Attn: Cheif Manager (Commercial) Ansal Bhavan, 10th Floor, 16, Kasturba Gandhi Marg, New Delhi 110 001.	Bright yellow sulphur. (99.5% purity)	6000 MT (1000 MT per month)	HCL:DLI:MAT: 306-002/92-93.II	15.5.92
Hindustan Petroleum Corpn. Ltd., Attn: Chief Manager, Materials, Hindustan Bhavan, 8, S.V. Marg, Ballard Estate, Bombay 400 038.	Sodium potassium sulphonate	180 MT	HPC/418/VBN/92	20.5.92
	Emulsifier 'S'	170 MT	HPC/419/VBN/92	25.5.92
	Rapeseed oil	70 MT	HPC/420/VBN/92	28.5.92
	Rice Bran Oil	40 MT	HPC/421/VBN/92	28.5.92
	Microvan 1900	2 MT	HPC/422/VBN/92	29.5.92
	1,2,3-Benzotriazole	2 MT	HPC/423/VBN/92	29.5.92
	Malathion technical	40 MT	HPC/424/VBN/92	29.5.92
Modern Food Indutries (I) Ltd., Attn: General Manager, (Tech. & Mtrls), Palika Bhawan, 3rd Floor, R.K. Puram, Sector-13, New Delhi 110 066.	Calcium propionate Potassium bromate			26.5.92
Nepa Limited, Attn: Manager (Purchase), Nepanagar 450 221, Madhya Pradesh.	Hydrogen peroxide Sodium silicate	750 MT 1000 MT	PUR-1/A/1/92-93	29.5.92
Oil & Natural Gas Commission Attn: Dy Director (MM) OBG, Palavasana, Mehsana, Gujarat.	Demulsifier (oil soluble)	150 MT	MHN/SP/OBG/ MC/24/91-92	25.5.92
	Non-ferric alum	150 MT	MHN/SP/OBG/ MC/23/91-92	13.5.92
Oil India Ltd., Attn: Chief Materials Manager, P.O. Duliajan - 786 602, Dist. Dibrugarh, Assam.	Barytes (Barium sulphate) in free flowing powder form.	4000 MT	LP-879	10.6.92

(Tender forms are also available at their offices at Calcutta, Guwahati and New Delhi).

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Tamil Nadu Newsprint & Papers Attn: The Manager (Purchase), Kagithapuram 639 136, Karut Taluk, Trichy Dist., Tamil Nadu	Caustic soda lye (rayon gr.)	3600 MT	195	14.5.92
	Liquid chlorine	4800 MT		"
	Hydrogen peroxide	400 MT		"
	Sodium silicate	400 MT		"
	Gum rosin	450 MT		"
	Methyl violet	4000 Kgs.		"
	Victoria blue	1600 Kgs.		"
	Rhodamine	600 Kgs.		"

OFFERS FOR SALE

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Procter & Gamble India Ltd., Thane-Belapur Road, Digha Village, Kalwe, Thane 400 601, Maharashtra.	Scrap materials such as empty drugs, sugar bags, containers made of glass/plastic/polyethylene/tins/fibres etc.			18.5.92

INTERNATIONAL BULK CHEMICAL PRICES

SPOT PRICES AS ON APRIL 8, 1992

Product	European Price range	US Price range
Naphtha	$177-179/m.t. (cif)	
Gasoil	$175-176/m.t. (cif)	
Propane		29.25-29.5 cts/gal (fob)
Butane		35.25-35.5 cts/gal (fob)
Ethylene	$350-370/m.t. (cif)	15-16 cts/lb (del)
Propylene — Chemical grade	DM610-630/m.t. (cif)	12-13 cts/lb (del)
Polymer grade	DM650-660/m.t. (cif)	13.5-14 cts/lb (del)
Butadiene	$215-220/m.t. (fob)	12-13 cts/lb (cif)
Benzene	$335-345/m.t. (fob)	$1.17-1.19/gal (fob)
Toluene	$265-275/m.t. (fob)	89-90 cts/gal (fob)
Xylenes — Virgin	$285-290/m.t. (cif)	
Solvent	$280-285/m.t. (fob)	90-91 cts/gal (fob)
Para-xylene	$365-370/m.t. (fob)	17.5-18 cts/lb (fob)
Ortho-Xylene	$405-410/m.t. (fob)	17 cts/lb (fob)
Styrene — T1	$485-495/m.t. (fob)	
T2	$510-520/m.t. (fob)	19.75-20.25 cts/lb (fob)
Methanol — T1	$115-120/m.t. (cif)	
T2	DM205-215/m.t. (fob)	34-36 cts/gal (fob)
MTBE	$300-310/m.t. (fob)	87-88 cts/gal (fob)
Phenol	$400-415/m.t. (fob)	17-18 cts/lb (fob)
VCM	$270-290/m.t. (fob)	11.5-12 cts/lb (fob)
Fibre Intermediates		
Ethylene glycol	$345-360/m.t. (fob)	16 cts/lb (fob)
Acrylonitrile	$615-625/m.t. (fob)	$580-617/m.t. (fob)
Solvents		
IPA	DM810-850/m.t. (del)	24-25.5 cts/lb (fob)
MEK	DM750-780/m.t. (del)	23-25 cts/lb (fob)
Acetone	DM650-690/m.t. (del)	15-17 cts/lb (fob)
Ethyl acetate	DM1,240-1,300/m.t. (del)	36-38 cts/lb (fob)
Butyl acetate	DM1,230-1,260/m.t. (del)	35-36 cts/lb (fob)

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

ue ate)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
			JNPT (NHAVA SHEVA PORT)	
/5	G. Petrenko (V-10/92)	Transocean	Odessa; Illyichevsk; Havana (Cuba); Piraeus; Lattakia; Izmir; Mersin; Beirut; Istanbul; Salonica; Alexandria; Limmassol also Rumania & Bulgaria. And also Afghanistan.(Carting at Kalamboli & Taloja).	18/5
			BOMBAY PORT	
Port	Lion of Gulf	Unimarine	Jeddah; Aqaba.	15/5
/5	Ilovik	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	20/5
/5	Lanka Aruna	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	24/5
/5	Neustadt (V-629) (Ger)	Trident/P&O/	Jeddah; Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at 12B-ID for Trident). (Carting at T.P. No. 1 for P&O).	16/5
		Merzario/	Jeddah; Ravenna; Venice; Trieste; Ancona; Mersin; Limmassol; Piraeus; Alexandria. (Carting at M.O.D. No. 2).	
		Penguin/	Aqaba. (Carting at M.O.D. No. 1).	
		Patvolk	Aqaba. (Carting at Frere Basin No. 1).	
/5	Green Island	M.S.P.L.	Assab. (Carting at P/Q-PD).	14/5
/5	Tibor Szamuely (Rus) (Voy-126 W/B)	Transocean	Illyichevsk; Odessa; Izmail; Reni (U.S.S.R.); Russe (Bulgaria); Galatz Romania; Budapest (Hungary); Bratislava (Czechoslovakia); Pancevo; Belgrade/Beograde (Yugoslavia); Linz; Vienna (Austria); Deggendorff; Regensborg (Germany). (All Ports on River Danube). (Carting at N/O & G-PD).	14/5
/5	Neustadt (Voy-629)	P&O/	Dubai; Abu Dhabi; Muscat; Doha. (Carting at Timber Pond No. 4).	16/5
		Spoonbill/	Dubai; Sharjah; Ajman; Umm-Al-Quwain; Ras-Al-Khaimah; Abu Dhabi; Doha; Bahrain; Kuwait; Muscat; Bandar Abbas. (Crtg. at F.B. No. 1).	
		Patvolk/	Dubai; Muscat; Bahrain. (Carting at Frere Basin No. 1).	
		Silvership/	Dubai; Sharjah. (Carting at Frere Basin No. 1).	
		Penguin/	Dubai; Dammam; Riyadh; Abu Dhabi; Sharjah; Doha; Muscat; Jebel Ali; Bahrain; Kuwait; Bandar Abbas. (Carting at F.B. No. 5 & 6).	
		Merzario/	Dubai; Muscat; Sharjah; Bahrain; Kuwait. (Carting at M.O.D. No. 2).	
		M.S.P.L./	Dubai; Fujairah; Khorfakkan; Sharjah; Abu Dhabi; Muscat. (Carting at F.B. No. 5 & 6).	
		SDS Corpn./	Muscat; Bahrain; Kuwait; Dubai; Sharjah; Abu Dhabi. (Carting at E. Grain Depot).	
		Mercator	Dubai; Kuwait; Abu Dhabi; Sharjah; Jebel Ali. (Carting at F.B. No. 1).	
5	Sea Star	Worldlink	Kuwait.	14/5
/5	Hai Lee (V-4/92)	J.M. Baxi	Dubai; Dammam.	22/5
/5	Silver Glory (V-1)	Arebee	Lagos/Apapa; Abidjan; Tema (Direct); P. Harcourt; Takoradi; Lome; Cotonou; Douala. (Carting at M.O.D. No. 1).	25/5
/5	Eagle Star (Voy-086)	F.F.C. Co.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver (B.C.); New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Chicago; Atlanta; Philadelphia; Milwaukee; Dallas; Guam; St. Louis; Wilmington (B.C.); San Diego; Indianapolis & Central American Ports; Honolulu. (Carting at Timber Pond No. 3).	19/5

(1)	(2)	(3)	(4)	(5)
14/5	Green Island (USA) (Voy-3)	M.S.P.L.	Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	14/5
15/5	Kota Cahaya	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orleans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American and Pacific Ports. (Carting at B-PD).	18/5
		Trident	S. American; Carribbean & Central American Ports. (Carting at 12B-ID).	
15/5	Kota Cahaya	J. Mackintosh/ Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 3 for J. Mackintosh) (Carting at 12B-ID for Trident).	18/5
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S.	Darwin. (Carting at M.O.D. No. 2).	
18/5	Ilovik (V-15) (Cyp)	Arebee/	Dar Es Salaam & Mombasa (Direct); Re Union; Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Walvis Bay (Namibia); Zanzibar. (Carting at Frere Basin No. 3).	20/5
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at T.P. No. 4).	
19/5	Banglar Moni (Voy-25)	Sai Ship/	Mombasa; Dar Es Salaam (Direct); Zanzibar; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at M.O.D. No. 2).	21/5
		C.M.B.	Dar Es Salaam; Mombasa (Direct); Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in E. Africa. (Carting at E. Grain Depot).	
In port	Vishva Kaumudi	S.C.I.	(Seychelles); P. Louis. (Carting at B. Pier Extn.).	15/5
18/5	Ilovik	P&O	Colombo. (Carting at Timber Pond No. 4).	20/5
12/5	Tibor Szamuely	Transocean	Afghanistan. (Carting at N/O & G-PD).	14/5
15/5	Ramdas	S.C.I.	Colombo.	21/5
21/5	Lanka Srimathi	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama & FCL only Busan; Inchon; Osaka; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	24/5
14/5	Eagle Star (V-086)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong; Manila; Keelung; Kaohsiung; Main Japan Ports; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at T.P. No. 1).	19/5
10/5	Vermilion Bay (V-36A/B)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Carting at B. Pier Extn.).	16/5
		M.S.P.L./	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Surabaya. (Carting at F.B. No. 5 & 6).	
		Contfreight/	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports only (FCL) (Carting at Frere Basin).	
		U.L.A.	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese Ports. (Carting at B-PD).	
15/5	Kota Cahaya (CAH-004)	J. Mackintosh/	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang; Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Battar; Yokohama; Nagoya; Kobe; Ho Chi Minh; Main Chinese Ports. (Carting at Frere Basin No. 3).	18/5
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 12B-ID).	
		E.S.P.L./	Vietnam; Japan & Chinese Ports. (Carting at B-PD for E.S.P.L.).	
		Silver Ship	Far East Ports. (Carting at F.B.No. 1).	
27/5	Halborg	J.M. Baxi	Bangkok; Penang; Jakarta. (Also loads at Bedi).	31/5
10/5	Lyudmila Stal	Transocean	Kobe; Yokohama; Vladivostock.	21/5

KANDLA PORT

10/5	Ibn Al Haitham	Transworld	Gulf; U.K. Cont.; U.S. East & West Coast; Med. & West African Ports.	13/5

(1)	(2)	(3)	(4)	(5)
4/5	Dubai Success	Parekh	Dubai; Dammam.	13/5
12/5	Fremo Sirius	Sai Ship	Dubai; Bandar Abbas.	16/5
4/5	Rostov	Parekh	Jeddah; Aqaba.	13/5
3/5	Tropicana	Sai Ship	Jeddah; Aqaba; P. Sudan.	15/5

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
	BOMBAY PORT		
14/5	Green Island (V-3)	M.S.P.L.	U.S.A.
19/5	Hoegh Drake (V-0413)	Patvolk	U.S.A./Canada/Jeddah.
21/5	Irenes Diamond	Prudential	Cont.
15/5	Ramdas	S.C.I.	U.S. East Coast/Canada

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

PLASTIC MATERIALS IMPORTED BOMBAY (From 4.4.92 To 8.4.92) (Continued from previous issue)

POLYPROPYLENE: From USA: Flex Industries Ltd., 49.5 Mts., Rs. 11,27,266; Gujarat Propack Ltd., 15,000 Kgs., Rs. 4,54,721; Sun Vaccum Formers P. Ltd., 15 Mts., Rs. 4,21,449; From Yugoslavia: Indexim P. Ltd., 31,000 Kgs., Rs. 6,67,158; Nylofil Enterprises, 15.5 Mts., Rs. 3,33,586; Shree Arvind Plastics, 15.5 Mts., Rs. 3,33,811; Sweet Marketing India P. Ltd., 15,500 Kgs., Rs. 3,33,364.

POLYSTYRENE: From Korea: Aeron Udyog, 17 Mts., Rs. 3,72,059; Bright Brothers Ltd., 51 Mts., Rs. 11,16,177; D.R. Polymers P. Ltd., 85,000 Kgs., Rs. 14,63,265; Tainwala Chem & Plastics I Ltd., 51 Mts., Rs. 10,74,720; From Singapore: Thermopack Inds., 11 Mts., Rs. 3,32,928; From Korea: Xpro India, 51 Mts., Rs. 11,65,629.

POLYTERPENE RESIN: From Japan: Bhor Industires Ltd., 2,000 Kgs., Rs. 82,811; Sanghi Leathers (P) Ltd., 5,000 Kgs., Rs. 3,10,067.

POLYURETHANE RESIN: From Germany: Super Chemifex P. Ltd., 4,000 Kgs., Rs. 6,37,615; From Japan: Incab Industries Ltd., 250 Kgs., Rs. 1,09,482.

POLYVINYL BUTYRAL RESIN: From Germany: Dr. Beck & Co. I. Ltd., 600 Kgs., Rs. 1,16,737.

PVC RESIN: From Brazil: Autoplast, 50 Mts., Rs. 7,94,092; Cee Cee International, 36 Mts., Rs. 5,71,188; Chemiplast, 25 Mts., Rs. 3,96,893; Dimple Overseas Ltd., 133 Mts., Rs. 21,11,939; Dutron Plastics P. Ltd., 100 Mts., Rs. 15,91,213; Finolex Pipes Ltd., 1,000 Mts., Rs. 1,51,44,561; Geeta 15,87,516; Jagmohandas Harilal & Co., 20 Mts., Rs. 3,17,328; Jogani Exports, 40 Mts., Rs. 6,41,520; Mercury Cable Industries, 30 Mts., Rs. 4,80,668; M.G. Associates, 50 Mts., Rs. 7,84,228; PCL Enterprises Ltd., 2,00,000 Kgs., Rs. 31,72,685; Plast India Plastics, 27 Mts., Rs. 4,28,405; Plastotex Bombay Ltd., 75 Mts., Rs. 11,91,156; Ramakrishna Harihar Intnl., 27 Mts., Rs. 4,29,017; Tainwala Chemicals & Plastics, 144 Mts., Rs. 22,86,566; Sikha Polymers P. Ltd., 50 Mts., Rs. 7,93,782; Sushil Chemicals, 100 Mts., Rs. 15,87,448; From France: National Leather Cloth Mfg. Co., 28,000 Kgs., Rs. 6,61,253; From Korea: Caprihans India Ltd., 127 Mts., Rs. 22,42,858; Jain Compounding & Formulation, 2 Mts., Rs. 3,96,963; Jain Compounding & Formulation, 25.5 Mts., Rs. 40,82,361; Jee PVC Pipes P. Ltd., 248 Mts., Rs. 3,96,963; Trimurti Foods & Pharmaceuticals, 119 Mts., Rs. 19,08,607; From Mexico: Amar Deo Plastic Inds., 33.3 Mts., Rs. 5,39,230; Anurag Polycoaters, 25 Mts., Rs. 12,61,717; Cable Corporation of India, 1,04,000 Kgs., Rs. 17,29,416; Crystal Containers, 33.3 Mts., Rs. 5,35,176; From Mexico: Hitesh Plastics P. Ltd., 33.3 Mts., Rs. 5,35,176; Interlast, 26 Mts., Rs. 4,20,952; Libra Plast Ltd., 25 Mts., Rs. 6,33,988; Prakash Industries Ltd., 364 Mts., Rs. 57,12,973; Unimin India Ltd., 104 Mts., Rs. 16,32,588; From USA: Dimple Overseas Ltd., 63.800 Mts., Rs. 8,72,100; Pittie Indl. Commodities, 20 Mts., Rs. 2,62,679; Pittie Steels P. Ltd., 225 Mts., Rs. 29,55,132; Unnati Corpn., 373 Kgs., Rs. 1,42,363; Wavin India Ltd., 391 Mts., Rs. 53,62,082.

MATERIALS IMPORTED BOMBAY (From 9.4.92 To 10.4.92)

ACRYLAMIDE: From Japan: Anil Dye Chem, 4,000 Kgs., Rs. 1,53,792;

HKN Syndicate, 4,775 Kgs., Rs. 1,83,589; Pharmachem Traders, 15,000 Kgs., Rs. 5,76,720; Simer Chem Inds., 1,000 Kgs., Rs. 38,448.

ALKYLAMINE: From USA: The Dharamsi Morarji Chemical Co., 3,360 Kgs., Rs. 9,43,205.

2-AMINO-6-PICOLINE: From Switzerland: Ranbaxy Laboratories, 2,000 Kgs., Rs. 8,73,428.

BUTYL ACRYLATE MONOMER: From Japan: Hima Dye Chem Corpn., 14,400 Kgs., Rs. 4,47,180.

CAPROLACTAM MONOMER: From Netherlands: Sonia International, 1,08,000 Kgs., Rs. 54,88,302.

CARBAZOLE: From Germany: P.G. Chemicals Pvt. Ltd., 500 Kgs., Rs. 77,045.

1,7 CARBOMETHOXY NAPHTHOL: From Germany: Indian Dyestuff Inds. Ltd., 520 Kgs., Rs. 7,94,915.

CARBON BLACK: From Germany: Creative Polymers P. Ltd., 360 Kgs., Rs. 1,34,855.

CHLORDANE: From USA: Rallis India Ltd., 12,832 Kgs., Rs. 24,09,662.

CHLORHEXIDINE DIGLUCONATE 20%: From Spain: IPCA Health Products P. Ltd., 1,000 Kgs., Rs. 2,33,286.

2-CHLORO-2, 6-DIMETHYL-N (BUTOXY METHYL ACETANILIDE): From USA: Monsanto Chem Ltd., 95,040 Kgs., Rs. 58,86,804.

CITRIC ACID: From China: J.M. Sons, 20,000 Kgs., Rs. 5,71,698.

CLOVE OIL: From Indonesia: Allied Chemicals (India), 1,000 Kgs., Rs. 47,853.

CYCLOHEXANONE: From Netherlands: Rallis India Ltd., 34,080 Kgs., Rs. 9,87,772.

DANE SALT: From Singapore: Gujarat Lyka Organics Ltd., 3,000 Kgs., Rs. 17,30,161.

2, 6-DICHLORO ANILINE: From Taiwan: Hindustan Ciba Geigy Ltd., 4,500 Kgs., Rs. 24,28,880.

DICOFOL TECHNICAL 85% MIN: From Spain: Bharat Pulverising Mills Ltd., 5.040 Mts., Rs. 8,16,385.

DIETHYLENE DIAMINE: From Sweden: Gayatri Labs P. Ltd., 9,139 Kgs., Rs. 12,80,013.

DIMETHYL FORMAMIDE: From Japan: Bhor Industries Ltd., 30,400 Kgs., Rs. 8,72,120; Pasupati Acrylon Ltd., 91.20 Mts., Rs. 25,28,624.

EPICHLOROHYDRINE: From Japan: Delta Chemicals, 5,520 Kgs., Rs. 1,95,719.

2-ETHYL HEXYL ACRYLATE: From Korea: Taipack Ltd., 13.6 Mts., Rs. 4,59,903.

EUGENOL: From Indonesia: Allied Chemicals (India), 2,000 Kgs., Rs. 1,94,403.

GLYCERINE CRUDE: From Sri Lanka: Galaxy Surfactants (P) Ltd., 48,063 Kgs., Rs. 4,69,219.

HEXACHLORO CYCLO PENTADIENE: From Netherlands: Bharat Pulverising Mills Ltd., 19.840 Mts., Rs. 11,53,153; From USA: Excel Inds. Ltd., 19.05 Mts., Rs. 11,58,243.

HYDROXYLAMINE HYDROCHLORIDE: From Japan: Unimark Chemicals, 2,000 Kgs., Rs. 2,99,103.

HYDROXY ETHYL CELLULOSE: From USA: Mafatlal Dyes & Chemicals Ltd., 2,983 Kgs., Rs. 4,64,961.

ISOEUGENOL: From Indonesia: Allied Chemicals (India), 1,000 Kgs., Rs. 1,21,127.

ITACONIC ACID: From USA: Pidilite Inds. Ltd., 1,500 Kgs., Rs. 1,66,361.

LAURYL ALCOHOL: From Germany: Galaxy Chemicals, 13,200 Kgs., Rs. 5,35,622.

L-BASE: From China: M.J. Agro Chem P. Ltd., 750 Kgs., Rs. 15,65,205.

2,6-LUTIDINE: From Japan: Anisha Enterprises, 180 Kgs., Rs. 61,467.

MERCURY: From Germany: Mckenzie Exports, 345 Kgs., Rs. 2,23,277; From Spain: Century Textiles & Industries, 1,380 Kgs., Rs. 1,32,498.

METHOXYDIHYDROPYRAN: From USA: BASF India Ltd., 24,359 Kgs., Rs. 19,81,197.

2-METHYL NAPHTHALENE: From Japan: Lilychem Laboratories Pvt. Ltd., 1,000 Kgs., Rs. 1,04,265.

MICROCRYSTALLINE WAX: From Spain: Ya International, 9,000 Kgs., Rs. 2,40,618; From USA: Anand Holding Inc., 21,092 Kgs., Rs. 4,42,901.

MOLYBDENUM OXIDE POWDER: From Belgium: Bharat Heavy Electricals Ltd., 744 Kgs., Rs. 72,838.

MONOPHENYL GLYCOL: From USA: Dr. Beck & Co. (I) Ltd., 14,660 Kgs., Rs. 8,45,472.

NAPHTHALENE CRUDE: From Canada: Popular Chemical Co., 15.6 Mts., Rs. 2,16,847; Sterling Orgo & Inorgo Chem Pvt. Ltd., 31.2 Mts., Rs. 4,33,694; From France: Zenith Ltd., 62 Mts., Rs. 8,96,151.

NAPHTHENIC ACID: From Germany: Alpha Chemie, 3.120 Mts., Rs. 99,468.

N-BUTYL METHACRYLATE: From Japan: Shree Nathjee Inds., 2,520 Kgs., Rs. 1,90,052.

NICKEL BORON LUMPS: From UK: EWAC Alloys Ltd., 500 Kgs., Rs. 3,26,586.

NICKEL CATALYST: From Netherlands: Hindustan Lever Ltd., 20,449 Kgs., Rs. 4,46,438.

OCTOIC ACID: From Spain: Modern Chemicals & Plastics, 13,392 Kgs., Rs. 4,49,544; From USA: Aman Enterprises, 6,696 Kgs., Rs. 2,24,771.

OLEYL ALCOHOL: From Germany: Kores (I) Ltd., 3,400 Kgs., Rs. 3,01,669; Pepega Limited, 3,400 Kgs., Rs. 3,01,669.

ORTHO CHLORO TOLUENE 99% MIN: From Italy: Krypton Chemicals Pvt. Ltd., 6.160 Mts., Rs. 2,07,295.

ORTHO CHLORO TOLUENE: From Italy: M.J. Exports Ltd., 3,300 Kgs., Rs. 1,16,896.

PARAFORMALDEHYDE: From Spain: Asian Paints (I) Ltd., 16 Mts., Rs. 2,50,799.

PARAFORMALDEHYDE 91%: From Spain: Agarwal Industries, 9,000 Kgs., Rs. 1,24,738; Coates of India Ltd., 5 Mts., Rs. 69,502.

PARAFORMALDEHYDE 96%: From Spain: Agarwal Industries, 9,000 Kgs., Rs. 1,32,870; D. Jamnadas & Co., 18,000 Kgs., Rs. 2,60,855.

PARA TERTIARY BUTYL PHENOL: From Korea: Resins and Plastics Ltd., 4.12 Mts., Rs. 4,43,631.

PHOSPHATE ESTER: From UK: BASF India Ltd., 660 Kgs., Rs. 87,225.

PHTHALO DINITRILE: From Germany: Medinex Laboratories Pvt. Ltd., 100 Kgs., Rs. 22,139.

POLYVINYL ALCOHOL: From Germany: Wimco Pen Company 15.480 Mts., Rs. 6,86,740; From Japan C.K. Textiles, 2 Mts., Rs. 1,15,344 Pidilite Industries Ltd., 17 Mts., Rs 9,05,007.

POLYVINYL PYRROLIDONE From USA: Ranbaxy Laboratories Ltd. 399 Kgs., Rs. 1,83,832.

PROPIONIC ACID: From USA Industrial Organic Corpn., 43,200 Kgs. Rs. 10,84,383.

PYRIDINUM: From Germany National Electro Platers, 1 Kg. Rs. 1,39,478.

RESORCINOL: From Japan: Shal Corpn., 2,000 Kgs., Rs. 2,66,179.

THIOGLYCONIC ACID: From Germany: Ala Chemicals Ltd., 48 Kgs., Rs. 5,51,371.

TOLUENE DI ISOCYANATE From USA: Polyfoam, 18,000 Kgs. Rs. 11,28,823.

VITAVAX TECH: From Canada: The Punjab State Co-operative 25,000 Kgs., Rs. 82,99,505.

YELLOW PHOSPHORUS: From China: United Phosphorus Ltd., 46.8 Mts., Rs. 20,36,388.

DRUG MATERIALS IMPORTED BOMBAY (From 9.4.92 To 10.4.92)

CARBAMEZEPINE BP 88: From China: S.G. Pharmaceuticals, 500 Kgs., Rs. 8,27,438.

CETIOL V: From Germany: Germen Remedies Ltd., 350 Kgs., Rs. 74,388.

D-PANTHENOL USP: From Japan: Croydon Chemical Works Pvt. Ltd., 500 Kgs., Rs. 3,54,905.

IMIDAZOLE: From Germany: Bayer (India) Ltd., 100 Kgs., Rs. 34,011.

INDOMETHACIN BP 80: From China: Bombay Pharma Products, 500 Kgs., Rs. 2,29,695.

LACTOSE IP/BP/USP 200 MESH: From Netherlands: Pragati Chemicals, 18 Mts., Rs. 5,52,627.

MANNITOL BP 80/USP 21: From China: M.J. Exports Ltd., 2,000 Kgs., Rs. 2,12,943.

PIRACETAM 99.9% MIN: From China: Brown & Burk Pharma Pvt. Ltd., 2,000 Kgs., Rs. 9,97,530; From Hong Kong: Torrent Laboratories Ltd., 500 Kgs., Rs. 2,78,492.

PLASTIC MATERIALS IMPORTED BOMBAY (From 9.4.92 To 10.4.92)

HDPE: From Brazil: Gujarat Metal Cast P. Ltd., 10 Mts., Rs. 2,14,422; Plast Fab: 40 Mts., Rs. 8,60,476; Polyolefins Inds. Ltd., 200 Mts., Rs. 47,81,224.

HDPE: From Italy: Cheviot Co. Ltd., 48 Mts., Rs. 10,97,661; Paharpur Plastics, 16 Mts., Rs. 3,68,428; From Korea: Ashish Trading Co., 48 Mts., Rs. 10,27,431; Associated Brothers, 196 Mts., Rs. 41,03,736; Cyma Dassani Marketing P. Ltd., 16 Mts., Rs. 3,33,687; Fibro Plast Corpn., 16 Mts., Rs. 3,41,978; Hankhul Packwell Inds., 32 Mts., Rs. 6,93,625; Hico Enterprises, 30 Mts., Rs. 6,05,012; Hind Exim, 16 Mts., Rs. 3,46,400; Jyoti Impex, 8 Mts., Rs. 1,68,410; Kanpur Plastipack Ltd., 48 Mts., Rs. 10,54,418; K. Raheja Mercantile Corpn., 16 Mts., Rs. 3,27,412; Krishna Filaments Ltd., 160 Mts., Rs. 37,51,420; Malet Welding Works, 32 Mts., Rs. 7,02,272; Mehta Traders, 16 Mts., Rs. 3,36,902; Naresh Paper Bag Co., 16 Mts., Rs. 3,51,145; National Woven Sacks P. Ltd., 48 Mts., Rs. 10,62,061; Omniplast Bombay P. Ltd., 32 Mts., Rs. 6,55,520; Pioneer Plastic Ltd., 16 Mts., Rs. 3,46,592; Plastchem Industries, 16 Mts., Rs. 3,51,134; Polycans, 16 Mts., Rs. 3,38,048; Prime Pick N Pack P. Ltd., 18 Mts., Rs. 13,40,802; Priya Plastics, 329 Mts., Rs. 8,18,920; Raj Polymers P. Ltd., 32 Mts., Rs. 6,55,808; Shanti Enterprises, 16 Mts., Rs. 3,51,169; Shriram Chemicals, 16 Mts., Rs. 3,50,172; Sindhu Plastics (India), 16 Mts., Rs. 3,28,062; Texplast Engineers P. Ltd., 32,000 Kgs., Rs. 7,56,151; Vishal Commercial Corpn., 8 Mts., Rs. 1,68,855.

HDPE: From Saudi Arabia: Anantrai Harivallabhadas, 24.750 Mts., Rs. 4,61,154; Esskay Plastics, 51.450 Mts., Rs. 10,72,766; Evergreen Plastic Corpn., 51.450 Mts., Rs. 10,90,518; HEB Luggage Inds. Ltd., 34.300 Mts., Rs. 7,40,538; ITC Agro Tech Ltd., 34.300 Mts., Rs. 8,06,157; Plasmachem Industries, 17.150 Mts., Rs. 3,75,341; Plastchem Inds., 17.150 Mts., Rs. 3,90,558; Plastic Processors, 51.450 Mts., Rs. 10,77,838; Polyset Products P. Ltd., 17.15 Mts., Rs. 3,44,908; Tirupati International, 17.150 Mts., Rs. 3,49,981; Unilite Plastic Inds. P. Ltd., 16.500 Mts., Rs. 3,36,716; VIP Inds. Ltd., 123.75 Mts., Rs. 24,15,570.

HDPE: From Singapore: ES Sales Exim P. Ltd., 17 Mts., Rs. 3,73,541; Vijaya Woven Sacks P. Ltd., 17 Mts.,

Rs. 3,75,598; From Thailand: Manish International, 16.5 Mts., Rs. 3,66,444; From UAE: Mitsukosh Thermoware, 17.150 Mts., Rs. 3,67,733; From Thailand: Sindhu Plastics, 17 Mts., Rs. 3,66,244; From USA: Ami Pyroflex P. Ltd., 20 Mts., Rs. 3,71,604; Goel Enterprises, 19.277 Mts., Rs. 3,33,523; Lahoti Techno Plastic P. Ltd., 17.5 Mts., Rs. 3,36,420; Pushpa Impex P. Ltd., 52.500 Mts., Rs. 9,78,204; Rasiklal Mansuklal & Co., 17.5 Mts., Rs. 3,26,068; Sipani Inds., 40 Mts., Rs. 7,68,960; Sundar Fabrics, 40 Mts., Rs. 7,68,960; Vishal Plastics, 70 Mts., Rs. 12,42,168.

LDPE: From Saudi Arabia: Universal Polypackaging, 16,500 Kgs., Rs. 3,80,636; From Yugoslavia: Arun Investment Corpn., 5 Mts., Rs. 1,11,214; From Korea: The Bharat Vijay Mills Ltd., 32 Mts., Rs. 6,99,068.

LLDPE: From Netherlands: The Supreme Inds. Ltd., 45 Mts., Rs. 12,14,858; From USA: Vindhya Telelinks Ltd., 40 Mts., Rs. 7,22,644.

POLYPROPYLENE: From Brazil: Bajaj Plastics Ltd., 300 Mts., Rs. 58,34,976; B.R. Enterprises, 27 Mts., Rs. 5,44,512; Darshit Impex P. Ltd., 50 Mts., Rs. 10,40,510; Diamond Polyprints, 20 Mts., Rs. 4,15,800; Essel Mining & Inds. Ltd., 50 Mts., Rs. 9,93,908; Fibro Plast Corpn., 5 Mts., Rs. 1,03,988; Hind Polymers, 9 Mts., Rs. 1,81,492; Jyemko, 20 Mts., Rs. 3,83,130; Kanpur Plastipack Ltd., 60 Mts., Rs. 12,62,581; Naresh Traders, 27 Mts., Rs. 5,60,526; Narmada Plastics P. Ltd., 100 Mts., Rs. 19,60,129; Pallavi Udyog, 18 Mts., Rs. 3,78,448; Priyadarshini Packaging P. Ltd., 27 Mts., Rs. 5,30,096; Roshma Polypack, 50 Mts., Rs. 10,37,895; Shankar Packaging Ltd., 20 Mts., Rs. 3,89,545; From Germany: Cheviot Company Ltd., 60 Mts., Rs. 13,05,376; From Hungary: Fibro Plast Corpn., 44.400 Mts., Rs. 9,32,335; From Korea: Baba Corporation, 48 Mts., Rs. 9,12,754; Hico Enterprises, 15.5 Mts., Rs. 3,30,978; Plastic Processors, 46.500 Mts., Rs. 10,22,004; Siddharth International, 124 Mts., Rs. 25,36,280; Spam Poly Plast, 32,000 Kgs., Rs. 6,86,645; From Korea: Sushil Chemicals, 15 Mts., Rs. 3,20,467; From Saudi Arabia: Ellora Chemical Works, 9 Mts., Rs. 1,80,697; From Singapore: Bright Brothers Ltd., 16 Mts., Rs. 3,64,369; Glassopack P. Ltd., 16 Mts., Rs. 3,64,369; Hindustan Syringes P. Ltd., 16 Mts., Rs. 3,28,527; Narendra Polyplast, 16 Mts., Rs. 3,54,904; Rajasthan Petro Synthetics Ltd., 64 Mts., Rs. 14,00,691; From Thailand: K. Raheja Mercantile Corpn., 32 Mts., Rs. 7,07,024; From USA: The Supreme Inds. Ltd., 33.599 Mts., Rs. 7,62,026.

POLYPROPYLENE: From Singapore: Brite Automotive & Plastics Ltd., 32 Mts., Rs. 7,28,738.

POLYSTYRENE: From Korea: Blow Plast Ltd., 34 Mts., Rs. 7,76,171; Bombay Plastic Udyog, 17 Mts., Rs. 3,88,426; Eastern Zipper Co. P. Ltd., 51 Mts., Rs. 11,19,732; Nik Polymers International, 9 Mts., Rs. 2,04,957 Pushpak Plastics P. Ltd., 17 Mts., Rs. 3,53,258; Unilite Plastic Inds. P. Ltd., 51 Mts., Rs. 10,60,319; Varsna Poly Products P. Ltd., 85 Mts., Rs. 17,66,290.

POLYURETHANE: From China: Godrej & Boyce Mfg. Co. Ltd., 10,500 Kgs., Rs. 5,54,317.

PVC RESIN: From Brazil: Billion Plastics P. Ltd., 36 Mts., Rs. 5,71,294; Consumer Plastics P. Ltd., 84.6 Mts., Rs. 12,86,775; Finolex Pipes Ltd., 826.200 Mts., Rs. 1,51,44,560; Mahavir Chemical Inds., 72 Mts., Rs. 11,42,889; PCL Enterprises Ltd., 75 Mts., Rs. 11,91,423; Ramakrishna Harihar Intnl., 27 Mts., Rs. 4,29,017; Rigidor Plastics P. Ltd., 63 Mts., Rs. 10,01,273; Shree Ramakrishna Harihar Intnl., 81 Mts., Rs. 12,87,017; Sushil Chemicals, 120 Mts., Rs. 19,05,238; Uniflex Pipes and Fittings P. Ltd., 50 Mts., Rs. 7,94,142; From Greece: Accurate Extrusions, 270 Mts., Rs. 20,45,250; Uniplas India Ltd., 250 Mts., Rs. 37,80,846.

PVC RESIN: From Japan: Shriram Vinyl & Chemical, 2 Mts., Rs. 1,35,527; From Korea: Amar Plastics, 102 Mts., Rs. 16,37,468; Dimple Overseas Corporation, 262.53 Mts., Rs. 24,52,230; Jayantilal Mangaldas & Sons, 88 Mts., Rs. 13,55,156; Mahalchand Motilal Kothari, 389 Mts., Rs. 41,30,205; Rama Enterprises, 34 Mts., Rs. 5,55,736; From Mexico: AMC Coated Fabrics P. Ltd., 26,000 Kgs., Rs. 5,82,596.

PVC RESIN: From Mexico: Calcutta Chemical Agencies, 49,950 Kgs., Rs. 8,00,723; Jai Industries, 77.129 Mts., Rs. 10,60,374; Thor Polymers P. Ltd., 26 Mts., Rs. 3,67,924; From Saudi Arabia: Jayantilal Mangaldas & Sons, 8 Mts., Rs. 1,23,196; From USA: Pittie Ferro Alloys Corpn., 125 Mts., Rs. 16,41,740.

SYNTHETIC RESIN: From USA: Nicholas Laboratories India Limited, 24.000 Lbs., Rs. 4,96,866.

MATERIALS IMPORTED BOMBAY (13.4.92)

ACRYLAMIDE: From Japan: Kalpesh Chemical Ltd., 1,000 Kgs., Rs. 38,448; From Japan: Paramount Dyes & Chemicals P. Ltd., 15 Mts., Rs. 5,98,902.

AMINO ETHYL ETHANOLAMINE: From Sweden: Henkel Chemicals India Ltd., 3,000 Kgs., Rs. 2,71,320.

ANILINE OIL: From Japan: Bayer (India) Ltd., 15,000 Kgs., Rs. 4,21,450.

ARSENIC TRIOXIDE: From Belgium: Bharat Elect. Ltd., 12,500 Kgs., Rs. 4,03,280.

BISPHENOL A: From Korea: Dr. Beck & Co. Ltd., 32,000 Kgs., Rs. 9,93,734.

BUTANEDIOL: From Germany: Atlas Wires Ltd., 2.100 Mts., Rs. 1,20,881.

BUTYL ACRYLATE: From Japan: Metro Enterprises, 9,000 Kgs., Rs. 2,79,488.

CARBOFURAN: From Korea: Rallis India Ltd., 18,000 Kgs., Rs. 57,45,566.

CETYL PALMITATE: From Germany: Procter & Gamble India Ltd., 760 Kgs., Rs. 68,515.

CITRIC ACID: From Hong Kong: Visaria Corpn., 20 Mts., Rs. 5,32,357.

2-CYANO PYRAZINE: From Japan: Uni Sankyo Ltd., 1,000 Kgs., Rs. 8,25,326.

DIMETHYL FORMAMIDE: From Japan: B. Pankajkumar & Co., 15.200 Mts., Rs. 4,40,555.

EPICHLOROHYDRIN: From Germany: Bharat Jyoti, 8,510 Kgs., Rs. 3,24,675.

3-ETHOXY PROPYLAMINE: From Japan: Jaysynth Dyechem Ltd., 2,040 Kgs., Rs. 3,44,548.

ETHYLENE VINYL ACETATE: From USA: Kumar Printing Inks P. Ltd., 1,500 Kgs., Rs. 1,26,250.

GUM ROSIN: From Indonesia: Vijay Varnish Co., 36,000 Kgs., Rs. 5,32,357.

HEXACHLOROCYCLOPENTADIENE: From USA: Bharat Pulverising Mills Ltd., 40,007 Kgs., Rs. 22,35,108.

IRON OXIDE POWDER (SYN.): From Japan: SKF Bearings India Ltd., 500 Kgs., Rs. 49,538.

ISOBUTYL BENZENE: From China: Sekhsaria Chemicals P. Ltd., 13,600 Kgs., Rs. 1,06,992.

ISOPHORONE: From Italy: Rainbow Ink & Varnish Mfg. Co. Ltd., 15,200 Kgs., Rs. 5,35,024.

ISOTHALAMIC ACID: From USA: Rhone Poulenc India Ltd., 4,200 Kgs., Rs. 78,03,679.

CHEMICAL WEEKLY

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Chernobyl in the news again

UNDER the somewhat intriguing headline "Business via hospitality", the *Financial Express* reported in mid-January the arrival at the Bombay Airport on 14th January of twenty kids in the age group of 9 to 14.

The children came from far off Ivja a small town, in Grodno, Byelorussia, near the Polish border, a place approximately 600 kms from Chernobyl. The Chernobyl nuclear disaster of 1986 still haunts the lives of the residents. Normal life continues to be totally disrupted with the children having to bear the massive psychological left overs of the catastrophe.

Detailing the life of the children back home, Dr. Risz, Chief Pediatrician, Ministry of Health, Government of Byelorussia said even simple pleasures of life were denied them by numerous restrictions as the area was contaminated. A walk in the woods, playing in the garden, eating wild fruits, fishing, using milk or any other food from the area did not form a part of the lives of the kids. So much so the children are being deprived of taking a plunge in the river. Lack of fresh, green vegetables and fruits has lead to anaemia and related disorders. Apart from a decline in body resistance, the kids are fast losing confidence. This, she says, may have severe repurcussions on a child's psyche and distort normal development.

The main problem, says Dr. Risz, is a loss of trust in the whole system. She referred to a fine distinction drawn between areas affected by the N-fallout. Places falling within a 30 km radius from Chernobyl N-plant have been totally evacuated.Areas beyond are believed to be affected by varying degrees and the situation gets worse as technology for determining the level of radioactivity is not available in the country, she says.

People continue to live in these areas with the dread of slow death hanging over them. To put it in her words, the 30 km radius is "dirty" with the remaining affected areas are not clean. The Ukrainian Parliament decided in October, '91 to shut down the Chernobyl nuclear power completely. The second block of the lower plant, which is considered the most dangerous in the world, will be shut down immediately while the first and third blocks will be shut down "in the shortest possible period, and not later than 1993."

The fourth block of the plant is already covered in concrete after the nuclear disaster in 1986. The legacy of Chernobyl has become more prolonged and widely distributed in lands far away from Russia as well.

The spread of nuclear debris over Europe

At the time of the explosion, a ridge of high pressure was centred over northwest USSR. The wind circulation associated with this ridge carried the upper part of the plume towards the Baltic Sea and Scandinavia. Nearer the ground, the nocturnal clear skies had resulted in the development of a 500 m deep surface-based inversion. This, although not preventing the sedimentation of the larger particles in the airborne debris, helped to insulate the local population from the downward diffusion of inhalable small particles that could have caused a great deal of human lung damage.

When the plume reached Scandinavia, it split into three 'fingers'. One moved away to the east, across northern parts of the USSR into Japan and China. A second, which was created by a jet ahead of the cold front of an active depression, crossed central Norway and moved out into the Norwegian Sea and towards N America. Heavy rain that affected this finger on 28 April resulted in very large depositions of radioactivity in central Scandinavia; this contaminated the lichens and mosses that are the main diet of the Lapp reindeer. A third finger moved South-Westwards in response to a transient ridge of high pressure which followed the depression across NW Europe. The finger moved across central Europe and the Alpine areas into France, and then turned northwards, entering the UK in the early hours of Friday 2, May.

Passage over the UK

The passage of the debris over Britain makes an interesting story. Its movement was traced by means of surface geostrophic winds and a body of radiological measurements taken at the time at nuclear power stations, research stations and sites of the National Radiological Protection Board (NRPB). The measurements included levels of gamma-ray and gross beta activity, and the concentrations in air of caesium-137 and iodine-131. Although some small difficulties were experienced a reasonably coherent picture of the movement of the debris emerges, and it is summarised as follows.

Friday 2 May 1986

Friday was a beautiful, warm sunny day over the Southern half of Britain, with temperature reaching 22 C in Berkshire. Winds were from the south, drawing in Continental and Mediterranean air over the country. However, a depression to the southwest of Cornwall was deepening and moving into the approaches to the Bristol Channel. Some instability and showers were experienced over North Wales. Cumbria and Western Scotland in the latter part of the day. Accumulated rainfall up to 0900 GMT (Greenwich Mean Time) on Saturday morning reached over 5 mm at a few isolated places in Wales and Cumbria, and up to 12 mm at Wigtown in SW Scotland.

The Chernobyl debris reached the north coast of France by 0000 GMT; southerly winds carried the leading edge of the debris to the Channel coast of England by 0300, and over much of southern England (excluding the southwest) by 0600. The western edge of the debris seems to have remained static for most of Friday, extending from about Lyme Bay on the South Coast to Bridgwater in Somerset.

At 0900 GMT the geostrophic wind was about 10m s^{-1} from the southeast, and was fairly uniform over England and Wales. This wind velocity is equivalent in three hours to a movement of just over 100 km at the leading edge of the debris. By 1200 the winds had eased over Wales as a small heat-low developed; but they had strengthened over northeast England, accelerating the movement of the debris over the Pennines towards Cumbria. The first shower of rain was reported near Montgomery in mid-east Wales at 1200.

The shallow heat-low intensified and stagnated over the Lancashire and N Wales area during the afternoon, leading to very light low-altitude winds and slow progression of the debris. A series of moderate showers was spawned over the Northern Wales.

Saturday 3 May 1986

The debris that was initially centred over northern Eng land drifted slowly northwards, to end over the Scottis Highlands. Fresher northeast winds off the western sid of Scotland vented some of the debris away across Ire land. On Friday the fine weather over much of Englan broke down completely, as thunderstorms advected i from France and a cold front associated with the activ depression off southwest England swept a band of rai across SW England and Wales. Heavyrain linked to bot these causes led to very significant wet deposition ove much of the British Isles, and to a marked reduction i the airborne load of radioactivity.

Sunday 4 May 1986

On Sunday the centre of the depression that had bee very slow-moving to the southwest of Cornwall bega to move northwestwards over Ireland, and began to fil Heat-low L_1 moved across Ulster and out into th Atlantic, while another heat-low — orginally linked wit L_1 — moved northwards up the east coast of Scotland giving slack winds over much of Scotland during th early hours. By midday, brisk southeastern winds ha become established right across Scotland. Showery rai was largely restricted to the coastal areas.

Deposition of hazardous nuclides

The cloud of debris contained a host of different radio nuclides originating from the reactor. From the viewpoin of health, the most important of these were:

- iodine -131, a short-lived isotope that gets into milk and then into human thyroid glands;
- caesium-134, with a half-life of about 3 years; and
- caesium-137, with a half-life of 30 years.

The caesium isotopes can accumulate in the human body and, like the iodine-131, can cause cancer. Nevertheless the risk of this is very small, and except in the most heavily contaminated areas around Chernobyl itself any increases in the incidence of cancer within the population are likely to prove undetectable. The main pathway for these isotopes into the body is not by direct inhalation but through foodstuffs. Consequently the activity has to be deposited first on the ground. This deposition arises not only from the 'cleansing' action of rain — a process generally termed 'wet deposition' — but also from dry deposition. This is the combined effect of the sedimentation of larger particles under gravity, the impaction of particulates and aerosols on leaves etc, and the absorption of reactive gases by the soil and vegetation.

In the Chernobyl debris, some of the iodine-131 was gaseous and some was particulate. The gaseous component drydeposited some eight times more rapidly than the particulate component. This can be inferred, in areas where no rain occurred, from the relative concentrations and depositions of. This reflected the retention of iodine-131 on grass in areas that had, and had not experienced rain.

Over much longer periods, only sheep farming was the consequences of real significance. In all other areas the levels of activity were well below the emergency reference levels set by the Government (except for some game birds and freshwater fish in limited parts of SW Scotland). Unfortunately many upland sheep-farming areas were affected by relatively heavy depositions of caesium-137, and this has led to restrictions on the movement and slaughter of sheep on farms where levels in excess of 1000 BQ kg have been recorded. To make matters worse, levels have changed only very slowly on some of these farms, in contrast to the more rapid decline observed in many low land areas.

The important element appears to be the nature of the soil. Free caesium rapidly becomes locked-into soils that are rich in clay minerals, and thus becomes unavailable to the vegetation. On the other hand the poor acidic soils typical of many upland areas are unable to do this, so the caesium is cycled through the uppermost humic layers of the soil and the vegetation, and its availabiliity to grazing sheep falls off only slowly. Consequently the levels in sheep that graze the upland hills for much of the year have fallen at a disappointing rate. Many sheep-farmers have been significantly affected by the restrictions imposed by the Government, although in many cases compensation schemes have helped to alleviate the situation.

When the Chernobyl cloud passed over the UK in early May, 1986, the deposition of radionuclides was significant only in the areas where rainfall coincided with the passage of the plume. National monitoring found the highest levels of the isotopes caesium 134 and 137 in the uplands of Cumbria, North Wales, and the west of Scotland. These areas are used mainly for free-grazing sheep farming, because the organic, peaty soils are so low in minerals that they will currently support no other major form of agriculture. To eliminate any possible risk to consumers, the Government adopted a very conservative action level for total radiocaesium in sheepmeat, and this remains in force. The mechanism for enforcement is known as the mark and release scheme-the movement and slaughter of sheep and lambs are controlled according to measurements of the level of activity in their flesh made with portable 'live-monitoring' equipment. Much of the area originally covered by restrictions has since been released, but there remain areas of more persistent contamination where restrictions continue to be necessary.

MAFF-the Ministry of Agriculture, Fisheries and Food-is responsible for the safety of the food chain in England and also provides scientific advice to the Welsh Office. The MAFF's programme of research has been centred largely on Cumbria, but the results are equally applicable in all areas of the UK affected, because the underlying factors are the same.

Caesium in soils and plants

Caesium deposited initially on vegetation was washed off into the soil, a process that takes a fewdays or weeks, depending on weather conditions. From there it was taken up by the roots and incorporated into the vegetation, consequently accumulating in the flesh of sheep grazing in these areas. For grass contaminated on the surface by direct deposition, the TF was 0.12 dkg whereas grass that subsequently picked up caesium by rootuptake gave a value of 0.33 dkg^{-1-15}. The material deposited directly, consisting of solid particles largely washed out of the plume by rain, was relatively insoluble, and much of it passed through the animals undigested; caesium within the plant system after root uptake is almost certainly in the aqueous phase and readily absorbed across the gut wall as the grass is digested.

There is a well established correlation between the plant uptake of caesium and potassium, an essential trace element; indeed, there is some controversy as to whether plants distinguished at all between these very similar cations. Their hydrated ionic radii are almost identical: $Cs+$ 0.228nm; $K+$, 0.232 nm. One of the factors governing the extent of caesium uptake is the availability of potassium: in potassium-rich areas, K will compete with Cs for the pathways across root walls. In mineral-deficient areas, such as the upland fells, less competition takes place; moreover the local vegetation is probably adapted to maximising the uptake of all such ions from the soil.

The transfer factor for radiocaesium from Chernobyl from soil to grass varied with time in 1987-89 at seven different West Cumbrian sites of different soil types. Cs was monitored because it was present only because of the Chernobyl accident, whereas there remains a significant ^{137}Cs background from earlier weapon test fallout. Even within this small geographic area, the range of transfer factors covers about two orders of magnitude;

deep peat shows values well above the maximum of the range quoted by Eisenbud. There is also a significant variation with the season, which is mirrored closely by measurements of potassium concentration in the vegetation: plants take up caesium along with other trace elements in the periods of maximum growth in spring and summer. Some other measurements in the affected areas have shown the same phenomenon. The repeated harvesting of vegetation also stimulates the uptake of caesium, presumably for the same reason.

The detailed analysis of the different soils in these and related studies shows that there are several factors that contribute to the differences in caesium availability. The concentration of available potassium and the percentage of clay in the soil composition are the two most important, although pH and wetness can also be significant. The role of clays is crucial in the long term behaviour of caesium in the environment. Like other metal ions, the fraction of caesium in solution is small in any soil.

There are areas in the UK were caesium from weapon test fallout can be found at levels comparable to the Chernobyl deposits, but where the caesium remains bound in the soil and does not enter the food chain. The Chernobyl caesium is a problem only in areas where the soil is peaty i.e, rich in organic chemistry flow in clay and potassium.

There is now plenty of evidence that clays can reduce the transfer of radio caesium from animal feed to final products such as milk, meat and eggs.

Research continues into these methods and other approaches involving animal management. Meanwhile, until one or more of these methods can be shown to offer a comparable level of assurance of consumer safety, all animals leaving the restricted areas for slaughter will continue to be individually monitored.

The Chernobyl fall out may indeed be much more wide spread and intensive than we have been led to believe till now. Inscrutable indeed are the pathways of nuclear radiation and annihilation of life.

— T.P.S. RAJAN

CHEMARENA

S.L. VENKITESWARAN

Dawn of a new era for petrochemicals in India?

The Cabinet Committee on Economic Affairs has now given the green signal for several of the projects which have been on the anvil for some years. The projects are Gandhar, Haldia, Auriya, Visakhapatnam, Thane-Belapur (NOCIL) and in Assam besides the ongoing Reliance cracker. These seven are expected to involve investment of Rs. 24,000 crores and include public sector and private sector though perhaps no foreign investment except in NOCIL. The promoters are identified for six but there are still no takers for the Assam cracker.

It is necessary to refer to the past developments in this thrust area. The National Front Government had ordered a full review of these projects which had received approval in principle from the earlier Government — four of these in a bunch. After several reviews the CCEA has now imposed conditions on the financing — the units will generate their own foreign exchange needs and not seek institutional finance, except for Haldia which had gone through this exercise several times and negotiated both external and IDBI assistance. Of course it is premature to consider conditions for the Assam project. Each project is to have four lakh tonnes ethylene capacity and downstream projects and a foreign exchange budget of Rs. 700 crores.

Besides this omnibus clearance what is of immediate importance is that the long-pending aromatics/PTA complex of Madras Refineries/SPIC in Tamil Nadu is through after its indefinite wait which has only doubled the project cost to over Rs. 1700 crores. We are promised that this project will be in operation in 33 months. Nothing is known on the status of the other aromatics complex at Saleempur in UP or on a proposal for an export oriented crackers in Madras by Linde/R.P. Goenka — an ill-conceived proposal which had also received approval in the Rajiv era.

Presently there are four crackers in operation.

1. Oswal Petro's 20,000 TPA ethylene for polyethylene with sale of propylene and benzene for Herdillia's downstream products. (This is inherited from Union Carbide).

2. NOCIL's cracker of 60,000 TPA ethylene plus all co-products with EO/MEG, HDPE, PVC, oxo-alcohols, acetone and derivatives — only HDPE is in an associated company PIL. Presumably clearance of PIL expansion is also included.

3. IPCL, India's very successful public sector cracker complex of 130,000/150,000 TPA ethylene alongwith co-products and a spectrum of products including LDPE, polypropylene, polybutadiene, PVC, acrylonitrile and acrylic fibres — many of these for the first time in India.

4. IPCL has also completed its second cracker complex based on C_2-C_3 — the Maharashtra Gas Cracker Complex, south of Bombay. This plant suffered a severe explosion at the gas receiving station and over a year has been lost. Now the downstream products are getting on stream and perhaps it will be fully operational in 3 months.

5. IPCL has been entrusted with the cracker complex at the new oilfield in Gandhar and ensure that there is no flaring of gas when the oilfield operates.

6. Reliance Industries made a big thrust in downstream products at Patalganga in Maharashtra — aromatics, PTA, linear alkyl benzene, all in world scale capacities. Their original intention was to make MEG and HDPE also at this site but shifted these items and also PVC (together with caustic soda/chlorine) to Hazira in Gujarat along with gas cracking to get ethylene. Unfortunately the financial needs were far bigger in spite of mega issues and Reliance decided to import ethylene initially and built up a terminal besides acquiring tankers. Presently the three products EO/MEG, PVC and HDPE are claimed to be operational. The cracker may take further two years and other products are in view.

7. There is also an oxo-alcohols plant based on propylene in Visakhapatnam due to start any time now. Also a butyl rubber project of UB Petrochemicals at Visakhapanatm on which the investments have gone upto levels which could lead only to high cost production — based on imported raw materials. UB Petro also makes propylene oxide and glycols using propylene from the

Madras Refinery — another plant is also there sharing the propylene available — both small sized plants using the old chlorohydrin route. There is a cumene-phenol-acetone plant based on propylene from Cochin Refineries just as Herdillia Chemicals have been making it from propylene supplies from Union Carbide. There are two other LAB plants and two caprolactam plants and generally the downstream plants have always been profitable.

There are several points of uncertainty due to the haphazard start-up of crackers after long intervals with a total capacity of about 500,000 tonnes ethylene a year including MGCC over a period of twentyfive years. No doubt some ethylene is made from ethyl alcohol for feeding styrene plants, requirements of which are far above capacity. We import butadiene in Kandla to make SBR rubber — in far off UP as the production based on ethyl alcohol was discountinued some years back. We import C_7 or C_8 olefine for feeding a plasticiser alcohol plant in Gujarat. Now besides Reliance importing large quantities of ethylene to feed downstream products until the cracker is constructed, we have also programmes to make PVC based on imported ethylene in Maharashtra.

The only redeeming feature is in products like acetic acid and derivatives from non-petro source ethyl alcohol — fully in line with the rising requirements. Styrene and some PVC is also linked to ethyl alcohol but in small capacities. To this we have added an MEG plant of 20,000 TPA based on ethyl alcohol produced and used captively — a successful venture. Another EO/MEG plant of 50,000 TPA is under construction in Maharashtra with no ethyl alcohol production but purchased from the many small producers of the state from a wide area. It remains to be seen how far this venture will succeed — much will depend on the cost of transport of ethyl alcohol from fairly long distances. Styrene monomer linked to alcohol in Maharashtra and UP have been mooted but no project has really taken shape. What is surprising is that an excellent process for ethyl benzene directly from ethyl alcohol and benzene has been developed at NCL, Pune and operated at a commercial scale but there are no takers.

We have been continuously facing shortages after shortages of basic petrochemicals and polymers and imports regularly run into over a thousand crores a year. The import of monomers and olefins is another burden. The neighbouring countries of South Asia/Pacific are much ahead with South Korea as a leader/exporter. The recent clearance for seven projects is only the first step in a chain of orderly development that is needed without bunching of projects starting near about the same time and facing marketing problems.

We are still not clear on our feedstock position and estimates of naphtha for cracking vary from one extreme to another. It is also necessary to see that the long neglected Assam region comes alive with the proposed new refinery and cracker complex. Gas in Tripura is to be converted to methanol but with little outlet except perhaps as a fuel blend.

We still find claimants of new projects for petrochemicals without any clear idea of feedstock position. The latest is the plan for acrylonitrile by GSFC in Vadodara where there is no propylene in surplus. There are plants for methyl methacrylate using the hydrogen cyanide route, reportedly at the stage of construction.

The new petrochemical era has to open up a new chapter in our industrial development and be able to rid us of import burden and high prices.

Caprolactam pricing

After years of delay and steep escalation in costs to Rs. 375 crores FACT have been producing and marketing caprolactam for about a year. As usual pricing is a contentious issue and there are only two producers who could work out an agreed sale price. FACT has benifitted by this new high cost product though it is burdened with the lower price realisation on ammonium sulphate by product, as much as five times caprolactam. Recent policy changes on fertiliser pricing have added to the problems. Import parity is uncertain when prices fluctuate and a ceiling on import duty levels are now an accepted policy. FACT's price had been increased to Rs. 72,500 per tonne as against landed cost of Rs. 82,000 on cif $1,750 plus import and CVD.

The price realisation on ammonium sulphate is low at Rs. 2,350 per tonne as urea price is heavily subsidised to a level of Rs. 3,060 per tonne. This problem needs to be tackled urgently. The price of benzene in India is also unreasonably high at Rs. 11,000 per tonne.

Hoechst AG to raise stake in Colour-Chem

Hoechst AG, the German chemical conglomerate, has decided to raise its equity in Colour-Chem from 40 per cent to 51 per cent.

This follows the new government guidelines allowing freedom to shareholders in working out the modalities of increasing overseas equity in existing companies. This was communicated to *The Economic Times* by **Dr. E. Baltin,** chief delegate of Hoechst AG in India, through **Mr. K.R.V. Subrahmanian,** vice chairman and managing director of Colour-Chem. The exercise will be completed during this fiscal year.

The process of complying with the formalities has commenced in India and at Hoechst AG headquarters, Mr. Subrahmanian said. Hoechst AG has been exploring opportunities for increasing the Indian presence ever since India took to deregulation and liberalisation. The decision has been expedited in the case of Colour-Chem because of circumstances. Other Hoechst affiliates in India are Hoechst India (making pharmaceuticals and agrochemicals) and Polyolefins Industries Ltd. (making plastics and rubber chemicals).

Hoechst AG and Bayer AG originally had 16.4 per cent holding each in Colour-Chem. Hoechst AG purchased the Bayer AG stake some years ago, thereby raising its holdings to 32.8 per cent. Hoechst AG later bought the holding which Khataus had sold to Hoechst India, taking Hoechst AG holdings in the company to 40 per cent.

Last year, the company initiated a comprehensive programme of upgradation of technology and modernisation of its Thane and Roha factories involving a total outlay of about Rs. 30 crores. The programme, however, suffered delays due to the resource crunch experienced since May 1991. A Rs. 12-crores modernisation and incidental capacity expansion of diketene plant has now gone on stream and the production has been stabilised. This has raised diketene capacity to 4000 tonnes with corresponding increase in derivatives used in the manufacture of pharmaceuticals and pesticides. The phthalocyanine green plant is being modernised and relocated in Thane as per the directives of Maharashtra Factory Inspectorate.

The sales turnover during 1991-92 is expected to be in the region of Rs. 150 crores. Unlike many multinationals, Colour-Chem has been a net earner of foreign exchange, after deducting foreign exchange outgo on all counts including dividend repatriation. Export income during 1990-91 amounted to Rs. 20.82 crores. Foreign exchange outgo amounted to Rs. 6.29 crores, leaving a net foreign exchange earning of Rs. 14.53 crores. •

SFL TO ESTABLISH SALT REFINING UNITS ABROAD

Supplementary Foods (India) Ltd. (SFL), promoted by an NRI group, has received offers to set up salt refining-cum-iodising units in Dubai at a cost of Rs. 3 crores, and in Thailand at a cost of Rs. 4 crores. Besides setting up projects on turnkey basis, SFL plans to have an equity holding in both the ventures.

According to **Mr. Ajit Kumar,** managing director of the company, the Dubai party intends to set up a capacity of 12,000 MT per annum, whereas in Thailand the offer is to set up salt refining unit of a capacity of 20,000 MT per annum.

Dubai like many other Middle East countries meets its common salt requirement by imports. The main problem has been absorption of moisture during shipment, besides import of salt in containerised airtight packages proves extremely costly.

SFL has set up Rs. 5 crores project with a capacity of 44,000 tpa of refined iodised salt at Tarapur in Maharashtra. The company intends to expand the capacity by year end. In the initial stage, the company proposes to export its entire capacity of 18,000 MT per annum of refined salt. The company has already bagged an export order for 6,000 MT of refined iodised salt.

It has also received export enquiry for about 50,000 MT of refined iodised salt. Mr. Ajit Kumar said that there was good export potential for flavoured salts like garlic and onion salt. The company is negotiating with a leading US company for process knowhow and for franchise rights of flavoured salts. To part-finance the Tarapur project, the company plans to enter the capital market with a public issue in June this year.

MODI ALKALIES ACHIEVES HIGHEST EVER PRODUCTION

Modi Alkalies and Chemicals Ltd. has declared a dividend of 10 per cent for the year ended March 31, 1992. The company has achieved all-round growth during this period with the highest ever production of caustic soda at about 58,200 tonnes.

The company's turnover also went up remarkably by 37 per cent to Rs. 76 crores against Rs. 55 crores in the previous year. It has achieved an impressive 184 per cent increase in export turnover of its products. The exports increased to Rs. 9.80 crores against Rs. 3.45 crores in the previous year.

It has already commissioned a 12 mw captive power plant Similarly, the tri-chloroethylene project has also been commissioned during March 1992.

The energy saving project, which is under implementation, has made substantial progress and is expected to be completed in the next few months. All these project will further improve the working of the company in the coming years.

Chemical units to move court on alcohol cut

Some alcohol-based chemical units in Maharashtra say they are planning to move the court against the State Government's 10 per cent cut in alcohol allocations. Some units have also been allocated ad hoc quotas over the last few years and had created additional capacities for alcohol derivatives.

For them, the cut in quota works out to as much as 40 per cent, according to one affected party. In some cases, units with captive distilleries are not allowed to lift their own alcohol, it is claimed. The cut was imposed fearing a shortfall. Now that cane crop has been proved more or less equal to that of last year, there is no logic in continuing with the cut, the affected parties said. They claim that the government has resorted to the cut to help SM Dyechem's glycol project near Pune which requires massive quantities of alcohol.

Denying the allegation, SM Dyechem Chairman **Mr. S.M. Shetty** said the government move was a measure of caution because some 30-odd proposed new distilleries were being delayed for one reason or the other.

About his own project, he said the Union Government gave its approval only after the state government gave its commitment to supply the necessary alcohol. The state commitment on allocation was given three years ago after six month long deliberations. It had taken into account supply of alcohol to other states and overseas, as well as the non-availability of large storage capacity with Maharashtra.

The Rs. 350-crore project has a six months storage capacity while many other units did not even have one month's storatge facility. The allocation cut will be applicable to his project also, expected to go on stream towards the year-end. Mr. Shetty said it was regrettable that fingers were being pointed at him when existing distilleries are wasting 40 to 50 litres of alcohol for every tonne of molasses because of discontinous fermentation.

The industry should focus attention on increasing alcohol yield instead of standing in the way of a world-scale plant coming up in the state, he said.

ION EXCHANGE TIES UP WITH EUROPEAN COMPANY

Ion Exchange (India) Ltd., plans to enter into a transfer of technology agreement with a large European group to bring in the latest methods of reducing biological oxygen demand (BOD) from distilleries and converting it to methane gas, according to **Mr. V.R. Pavoor**, Executive Vice-president of the company.

He added that the name of the company could not be divulged because negotiations were still going on. The anaerobic treatment — which is treatment without air — will reduce BOD thus making the distillery eco-friendly but profitable. The methane gas produced, which is used for heating, will recover the cost of the treatment plant in a little over a year, added Dr. Pavoor.

The company also plans to launch products with genetically-engineered bacteria, using technology from a US company called sybron, that destroys cyanides and phenols and converts them into basic elements, said **Mr. Shankar Ranganathan**, President and Managing Director of Ion Exchange.

Apart from industrial applications, the company plans to brand the product for consumer use as the microbes can be used to destroy fats and oils in drains plus fungus in carpets. The industrial product will be available this month, said Mr. Ranganathan, though the launch of the consumer product would take some time. Ion Exchange is talk ing to four or five drug companies t enter an agreement to market cholesty amine resins in capsule or tablet form which is used to bring down cholestro said Mr. Ranganathan.

The resins which are marketed i India by Ion Exchange for the Frenc company Rohm and Haas, are also use industrially to recover heavy metal such as copper, silver and gold, fron water. Plus the resin recovers pheno instead of destroying it which is cost effective for a company, with pheno priced at around Rs. 30,000 per tonne added Dr. Pavoor.

HIKAL'S PLANT INAUGURATED

Dr. E. Baltin, Managing Director o Hoechst inaugurated the expansion o Hikal Chemical Industries Ltd., a Mahad MIDC on 11th April, 1992. Dr Baltin mentioned that Hoechst is now looking forward to increasing co operation with Hikal in future.

Hikal Chemical Industries Ltd., is manufacturer of speciality organi intermediates for drugs, pharmaceutical and agrochemicals. The plant is located at Mahad, which is 180 kms from Bombay.

The project work was started in 198 and the plant was commissioned in early 1991. This is a multipurpose plant which has sophisticated equipments such as glass-lined, stainless steel and carbon steel reactors, with capacity of upto 12,000 litres and vacuum fractional distillation columns (Sulzer).

It specialises in nitration, chlorinatio and amination unit operations. A present plant is producing substantia quantities of para cumidine, meta chloro aniline, 3,4 dichloro nitrobenzene About 25 per cent of Hikal's production is expected to Japan, China, Europe and USA.

Aid for setting up warehousing facilities in Rotterdam

The Netherlands Government has ffered financial assistance for setting p warehousing facilities in Rotterdam or Indian exporters. Though the Dutch ffer has only formulated the broad outnes, the Indian industry and government are eagerly studying it. The roposal is being considered as a good pportunity for exporters to face the hallenges of an anticipated increase in rade volumes with the European Community (EC).

The offer, which has been proposed by the Rotterdam Municipality and the Dutch Government, is conditional on the Indian parties joining hands with the Dutch forwarding company in setting up $2 million distribution centre with showroom and a pre-dominant warehousing linkage. The Dutch banks and the Government will subsidise 75% of the investment in the facility. India will have to put up only 25% of the two million dollar investment.

Industry is studying the possibility of forming a consortium of Indian exporters for negotiating with the Dutch Government. Signficantly, Rotterdam has emerged as the first choice for locating a wareshouse in a study commissioned by the Commerce Ministry and conducted by the Tata Economic Consultancy Services (TECS). Rotterdam scored over Hamburg, Antwerp and Bremen in terms of distance from various hinterland points, volume of cargo handled and availability of infrastructural facilities.

It is estimated that nearly half the population of Europe lies within a radius of 350 km of Rotterdam. In addition to excellent rail and road connections, Rotterdam has the advantage of the world's largest collection of inland fleet vessels which transport about 240 million tonnes cargo per year into the heart of Europe. The TECS study had concluded that in the context of an anticipated intensifying of competition for the EC markets, there was a need for a warehouse base in Euopre. The probable users of a warehouse in Europe would be exporters of castor oil, rice , cashew, spices drugs, pharmaceuticals, chemicals, leather, carpets, engineering goods and fruit and vegetable products.

The study pointed out that from the elimination of physical barriers in the single European market freight hubs would be created, ensuring that surface transport would gain in importance.

This would imply that the current method of directing exports to the port closest to the eventual destination would be outmoded. It would make more sense then to route India's exports through one port and store them at a warehouse if necessary for onward delivery, the study said. Further, with the proposed abolition of the collection of customs duties at the various checkposts, transport and warehousing costs are likely to decline by 20 per cent and surface transport time was likely to drop significantly, according to one study. It would be more cost-effective to route exports through one or more selected ports that will figure prominently in the proposed scheme of feight hubs. Currently, the bulk of Indian exports to the EC are routed through five ports.

Although detailed information on the creation of freight hubs in the post EC scenario was not available, indications were that some of the major port cities such as Rotterdam, Hamburg and Antwerp were likely to emerge as candidates, the TECS study said. The study has justified the need for establishing a warehouse in Europe on the grounds of a huge rise in export volumes expected in the next few years. Exports to EC are expected to increase from Rs. 9,084 crores in 1990-91 to Rs. 36,400 crores in 1995-96 at current prices.

Sika Qualcrete to expand in construction chemicals

Sika Qualcrete Ltd., a Development Consultants group company manufacturing specialised construction chemicals in technical and financial collaboration with Sika AG of Switzerland, has proposed to diversify into a related area having wide scope in India.

The company has identified three items — industrial adhesives, corrosion protection chemicals and polyurethane sports surfaces widely known as astroturfs — for its proposed diversification. The final choice of one of these items will be made soon.

Discussions in this respect are at an advanced stage with Sika of Switzerland and a decision on the same is expected to be firmed up shortly.

Following the same, the company's equity base would go up to Rs. 50 lakhs from Rs. 20 lakhs currently. An additional unit at Falta is also proposed to be set up. Sika Qualcrete, it may be mentioned, was floated by an NRI with 51 per cent equity stake in 1985 while the balance 49 per cent was owned by **Mr. Sadhan Dutt,** Chairman of Development Consultants group and his nominees. In 1987 the company entered into a financial and technical collaboration with Sika of Switzerland.

Following the tie-up the foreign company's stake was finalised at 40 per cent while that of Development Consultants and the NRI, **Mr. Bhaskar Sen,** who is currently Sika Qualcrete's Managing Director, stood at 30 per cent each.

The technical tie-up envisaged transfer of technology to the Indian partner for the manufacture of specialised construction chemicals used essentially for reducing input costs while at the same time improving the durability of the structure. Design-specific concrete was also proposed to be manufactured.

The 92-year-old Sika AG is the global leader in state-of-the-art construction chemicals business and has spread its ambit to over 50 countries worldwide. The annual expenditure on R and D at its Zurich plant alone is stated to be around Rs. 120 crores.

Among the chemicals manufactured in due course at Sika Qualcrete's 2,000 tpa plant at Kalyani near Calcutta were admixtures used to alter the properties of concrete while in its fluid state, epoxy formulations for underwater repair, and shrink-proof grouts.

The company was the first in India to manufacture melamine-based admixtures and epoxy formulations for underwater repair.

"We at Sika Qualcrete want to emerge as a one-shop concept in the area of construction chemicals. Our motto is: if you have a problem we have the solution", said Mr. Bhaskar Sen, Sika Qualcrete's Managing Director. "In fact, in the construction field, we are playing the role of a doctor, chemist and nurse all rolled into one", he adds.

According to Mr. Sen, the response from the construction industry to such speciality chemicals even as late as five years ago was not too encouraging.

However, with increasing awareness of the benefits of the same, the use of such speciality chemicals in construction activity is stated to be going up at a steady pace.

"The market for the speciality construction chemicals is doubling each year and will continue to do so for at least a few years more". According to estimates, every bag of cement sold gives the specialised chemicals industry a potential to sell Rs. 2 worth of specialised chemicals. The scope for the same can be gauged when one takes into account the fact that domestic consumption of cement currently stands at about 46 million tonnes.

Specialised chemicals are used in 90 per cent of concrete manufactured in the US while in Australia it is stated to be used in 76 per cent of the concrete manufactured. In India, such chemicals are used in hardly two per cent of the concrete manufactured.

"We are just scratching the surface. Even assuming that the production of cement does not grow and is maintained at the same level, the use of such chemicals is bound to pick up", says Mr. Sen.

The main hindrance domestically to the acceptance of such chemicals in construction stems from the fact that design system in construction and mining engineering have hitherto been orthodox rather than imaginative.

The rising demand has resulted in growing competition too. Others who have emerged as major players in the field are Fosroc Chemicals India Ltd. of Bangalore, MC Bauchemie and Roffe Chemicals of Gujarat and Structural Waterproofing Company Ltd. of Calcutta.

Sika Qualcrete has established its presence in overseas markets too. Having exported to countries like Bangladesh, Nepal, and Male, the company now proposes to venture into the markets of Europe. To enable it to do so it has already applied for approval under ISI 9000 specifications.

The company's turnover for the year 1991-92 stood at Rs. three crore, up from Rs. 1.98 crore during the year ended March 31, 1991. It hopes to net a turnover above Rs. six crore in the current fiscal year.

Southern Herbals to set up drug EOU

Societe Generale de Surveillance (SGS), the global preshipment testing and verification agency, has approved of the herbal products developed by Southern Herbals which go into the manufacture of anti-cancer medicines.

The company is setting up a 100 per cent export oriented unit (EOU) at Jigani in Bangalore district for the manufacture of high value drug intermediates. It will involve an investment of Rs. 17.95 crores. Periwinkle, one of the anti-cancer medicinal plants, has recently been recognised as one of the most important tropical herbs, according to the company.

The alkaloids, which are present in sub-microscopic quantities in the plant, command very high prices in the international market. "Southern Herbals, which has acquired the third largest process plant in the world, becomes the largest producer of these drugs in India", the company said in a press statement.

It says commercial production will begin October 1992. The promoters are from an agricultural family with large farm lands, which will supply the raw materials. In addition, the company has contracted a large number of farms for growing the herbs and medicinal plants. There will be no import content by way of raw materials or consumables. The value addition is to the tune of 50 per cent.

Southern Herbals has put to use Indian lab technology, which has been further developed in Germany and Japan to pilot scale and production scale. The process, the company said, has met every quality test. The US and British pharmacopoeia have specified standards of 95 per cent to 105 per cent purity for this class of drugs. The Southern Herbals process consistently yields a purity of 104 per cent, it said.

By utilising the latest available plant and technological developments from Germany and Japan, the company has already made pilot batches of alkaloids and their isolates like vinblastine, vincristine and ajmalicine. These have been tested overseas by both laboratories and manufacturers of final drugs and found to be of good quality, the company said.

The project and profitability projections have been appraised by IDBI on a conservative basis, showing a net profit of Rs. 1.41 crores on sales of Rs. 8.25 crores in the very first year, rising to Rs. 5.35 crores on sales of Rs. 20.63 crores in the third year. The company will enjoy benefits like total exemption from income tax for five years and 100 per cent convertibility on export earnings.

Of the total project cost of Rs. 17.95 crores, Rs. 9.68 crores is made up by loans from three financing institutions —IDBI IFCI and ICICI. The remaining Rs. 8.27 crores will be raised through an equity issue, which is expected to open in July.

ROURKELA NITRITE TIES UP WITH SAIL

Rourkela Nitrite Ltd. (RNL) becomes the first private sector company to enter into a working agreement with Steel Authority of India Ltd. (SAIL), Rourkela Steel Plant. The agreement provides for a steady supply of the effluent from the fertiliser unit's nitric acid plant through stainless steel pipelines.

Rourkela Nitrite is a prestigious venture set up with a view to extract from this effluent, highly purified grades of sodium nitrite and sodium nitrate at 2,560 tpa and 4,320 tpa respectively, through a process of evaporation and fractional crystallisation. Sodium nitrite and sodium nitrate have great demand in the industry. The government has been importing both these products in large quantities over a period of time.

Sodium nitrite is mostly used in dyes and dyestuff, analgin, vitamin B_2, folic acid, antibiotics and rubber chemicals. The cost for setting up this project is estimated at Rs. 6.53 crore. The same shall be financed with term loans of Rs. 3 crore, to be availed from IFCI, and equity capital of Rs. 3.53 crore, according to sources.

Of the total equity the company's promoters will be subscribing Rs. 80 lakh, mutual funds Rs. 50 lakh and the balance Rs. 2.23 crore shall be offered to the public by way of 22.3 lakh equity shares of Rs. 10 each for cash at par soon, the sources said.

Project Development India Limited (PDIL), a government of India undertaking, is supplying technology to the company. PDIL had also given technology to Deepak Nitrite and other companies.

It has also agreed to participate in the equity of the company to the extent of Rs. 5 lakh. Rourkela Nitrite is expected to commence trial production by December 1992 and commercial production by January 1993.

The break even point of the plant is estimated at 51 per cent at 90 per cent capacity utilisation.

CARBOHYDRATE CHEMISTS MEET

The recent trends in carbohydrate research will be discussed at the eighth conference of the Association of Carbohydrate Chemists and Technologists (India) beginning at Trivandrum on November 18.

Dr. Ashok Pandey, convener of the conference, said at Trivandrum on May 1 that the three-day conference would provide a forum for interaction among academic bodies, research and development laboratories, policy planners and industrialists.

New drug policy soon

The Prime Minister assured the consultative committee members attached to the Ministry of Chemicals and Petrochemicals on May 11, that a new drug policy is in final stages of clearance and it will be announced within the next two to three months.

Mr. Rao agreed to the suggestion of the committee members to call a separate meeting to discuss the various issues connected with the policy. The Union Health Minister, **Mr. M.L. Fotedar,** will also be consulted.

The Prime Minister emphasised the need to strike a balance between giving adequate incentives to the drug industry and keeping prices of essential medicines within reasonable check. All efforts are being made in the proposed drug policy to reconcile the seemingly conflicting objectives in the best manner possible and to remove the aberrations and anomalies in the existing policy.

Mr. Rao said that the need for review of the drug policy had arisen mainly on account of three factors. These are criticisms from Members of Parliament and others with regard to inclusion and exclusion of drugs under price control, complaints from the drug industry about the erosion of profitability due to price control and, lastly, the need for bringing provisions of the drug policy in consonance with the new industrial policy.

The members of the committee aired the view that there is an urgent need to ensure sufficient returns to the manufacturer to encourage fresh investments, new technologies and R and D investments in this priority sector.

A member suggested that the government should lay down the criteria for selection of drugs for price control which should be adhered to strictly.

Another member felt that the drug policy of 1986 had not been implemented fully and suggested formulation of a study group from amongst members of the consultative committee assisted by officials of all the departments concerned.

It was pointed out by a member that the drug sector at present is subject to dual price control wherein there is an overall ceiling on total profitability of a company as well as price control on individual products.

This has made the pricing system extremely cumbersome. He suggested that only the ceiling on total profitability should be enforced as it is not administratively feasible to fix prices of such a large number of individual drugs.

The members of the committee were assured that all the suggestions would be carefully considered by the government and appropriate action initiated.

Ranbaxy's turnover up 34 per cent

Ranbaxy has achieved a Rs. 333 crore turnover for 1991-92, with international business accounting for over Rs. 94 crore. A company release said the sales turnover grew by 34 per cent and exports by 59 per cent. The company's gross profit also increased by 37 per cent to Rs. 22.90 crore.

The release commented that the results were satisfactory, especially in the light of the adverse factors and uncertainties which have plagued the economy in general, and the pharmaceutical industry in particular, right through 1991-92. Though input costs increased considerably due to the import curbs, credit squeeze, high rates of interest, reduction in government subsidies, devaluation of the rupee and resultant inflation, the government did not sanction any price increase in drugs, the release said. It further alleged that the profitability of the pharmaceutical industry remained curbed due to the Drug Price Control Order (DPCO) which remained in force.

The release said the internationalisation of operations of the company, with increased focus on newer generation high value added products and volume sales to developed markets, with acceleration of exports to hard currency areas had helped the company in its steady performance. The company has also increased its investment in research and development to Rs. 7.5 crore during 1991-92. As part of an expansion programme, the company has set up a state-of-the-art plant in SAS Nagar, Punjab, for the manufacture of cephalosporins including cefaclor. This should pave way for increased exports to developed countries, the release said.

The new facility to produce latest generation fluoroquinolones, being set up at Dewas, is nearing completion. Initial trials have been successful and commercial production is expected to commence shortly, the release said. Ranbaxy has also sought government approval to set up a joint venture company in Hong Kong, to help strengthen its presence in the Far East.

EXTENSION MOOTED FOR VACCINE PROGRAMME

The mid-term evaluation team and the joint working group have recommended extension of the Indo-US vaccine action programme for another five years from July this year. The working group has authorised the vaccine action programme (VAP) secretaries in India and the US to seek necessary approval for the proposal from the respective Governments. The existing memorandum of understanding, signed in 1987 for a period of five years, would expire in July this year. The grant agreement for the programme signed between the Government and USAID is due to expire in August, 1993.

The team found the progress of implementation of the programme was satisfactory and the mechanisms for implementation like the joint format, peer review mechanisms, monitoring and evaluation mechanisms developed under this programme have emerged as a model for bilateral science and technology collaborations.

A total of ten collaborative research and development projects have been approved for implementation under this programme so far. According to the Department of Biotechnology, considerable progress has been made under the projects in creating the necessary infrastructure including procurement of equipment and appointment of scientific staff. Scientific work is also in full swing towards achieving the project objectives, it said.

PDIL COMMISSIONS UREA PLANT FOR WASTE WATER TREATMENT

Projects & Development India Ltd., (PDIL) a premier design engineering and technical consultancy organisation of the country, has recently successfully executed its urea thermal hydrolyser and stripper scheme to treat 35m³/hr effluents discharged from 1000 tpd urea plant of NFL at Nangal. The effluents contained urea and ammonia, the recovery of which on adoption of this scheme has improved overall ammonia utilisation efficiency besides contributing to abatement of toxicity and environmental problems. The scope of work entrusted to PDIL included detailed design, engineering, procurement, inspection, expediting, construction, commissioning, demonstration and guarantee test on turn-key basis. The project has been completed as per schedule saving foreign exchange to the tune of Rs. 1.5 crores in design engineering and consultancy services. All the guarantee parameters in accordance with the agreement between PDIL and NFL have been fully met. The plant is running smoothly and satisfactorily.

In India, though majority of urea plants have adopted modern effluent treatment devices, the older generation plants are still releasing pollutants. PDIL's system can be retrofitted in the existing urea plant or incorporated in grass-root plants. Earlier, PDIL had implemented the above system in HFCL's Namrup-III Fertiliser Plant with success. Another one at FCI's Talcher plant is under construction. After accomplishment of the Nangal Hydrolyser unit, PDIL has emerged as the only organisation of the country to have successfully integrated its excellent energy-efficient and import substitution technology with the existing urea plant with complete indigenous equipments, machinery and instruments.

The successful implementation of the above project has not only generated the confidence of the owner company in PDIL's technological excellence but it has also established PDIL's firm base in undertaking such assignments in future.

CFCL to start commercial production from August 1993

The giant gas-based fertiliser project of Chambal Fertilisers and Chemicals Ltd. (CFCL), at Gadepan near Kota in Rajasthan, has completed 73 per cent of work and is scheduled for mechanical completion by June 1993. The commercial production is expected to start from August 1993. The project, promoted by Zuari Agro Chemicals, headed by **Mr. K.K. Birla,** is designed to produce 7,42,500 tonnes of urea annually or it will manufacture nearly 15 million bags of urea every year. The state-of-the-art project will harness the most modern technology. The company has signed a technical collaboration agreement with Snamprogetti of Italy to provide the technical know-how and engineering services for ammonia and urea. Offsite facilities for Chambal are being handled by Toyo Engineering (India) Ltd., an associate company of Toyo Engineering, Japan. The agreement with Snam involves guaranteed performance in terms of yield and capacity output. CFCL's project at Gadepan is a green field fertiliser complex based on the gas transported from Bombay High via the HBJ pipeline.

The final project cost as appraised by the lead financial institution, Industrial Development Bank of India (IDBI) is Rs. 1,267 crores. This will be financed by the promoters for Rs. 150 crores, public issue of Rs. 212 crores, loan from financial institutions to the tune of Rs. 326 crores, loans from banks of Rs. 100 crores, foreign currency loans of Rs. 267 crores and a debenture issue of Rs. 212 crores. The company proposes to make a public issue of convertible debentures of Rs. 424 crores in June 1992 to raise equity capital of Rs. 212 crores and debentures of identical amount. Application has been filed with the Controller of Capital Issues (CCI) for the necessary sanction. Speaking to visiting newsmen from Bombay at the CFCL plant, **Mr. H.C. Grover,** Managing Director, said that CFCL had adopted the largest state-of-the-art technology, including distributed control systems based on computers with TV monitors and other latest technology features, thus ensuring a fail-safe system and optimised operational efficiency.

The Government had laid 1,700 kms pipeline for gas supply from Bombay High. Chambal plant was just 12 kms from the pipeline and work on the feeder pipeline to the plant had already commenced. He said, the project would have permanent water supply from Kalisindh river, a tributary of perennial Chambal river and flowing at a distance of just six kms, from the project site. Construction of intake-well and laying of pipeline to the receiving point at the project site is in advanced stage of completion.

Fertiliser manufacturers to form cartel for raw materials import

Fertiliser manufacturers in the country are in the process of forming a cartel for their imports of ammonia and phosphoric acid for the second half of 1992.

Major importers of the two fertiliser raw materials are planning to form a consortium under the aegis of the Fertiliser Association of India (FAI), according to highly-placed sources in the association.

They are expected to float tenders shortly inviting bids from suppliers, on a c.i.f. basis. Discussions are currently on within the FAI to finalise the members of the consortium.

Also, there is likelihood of the fertiliser companies forming more than one consortium on the basis of their requirements, regions etc. Almost all the big fertiliser companies like the Rashtriya Chemicals and Fertiliser, IFFCO, KRIBHCO, GSFC, SPIC, etc. are major importers of ammonia and phosphoric acid.

Hitherto, imports of fertiliser raw materials were canalised through Minerals and Metals Trading Coproration (MMTC), which has been directed by the government to import on f.o.b. basis.

The government has since decanalised imports of fertilisers. It is learnt that MMTC had offered to act as an agent for the industry for future imports of fertiliser raw material. However, it is unlikely that the fertiliser companies will accept the offer, as they are keen on executing the imports on their own, either as a consortium or individually. MMTC has finalised contracts upto June 1992. A direct fallout of imports on c.i.f. basis is that the fertiliser companies will now be able to nominate a shipping line of their own choice for carrying the cargo. Hitherto, MMTC had the option of nominating the shipping line.

As a result, Shipping Corporation of India (SCI), the main carrier of fertiliser imports will no longer get preferential treatment. Instead, it will now have to directly compete with the international shipping lines.

SCI has recently purchased two tankers soley for the purpose of carrying liquid fertilisers. According to a senior SCI official, the company will now have to settle for lower freight rates, if it has to compete on an international basis. "Indian companies are not in a very strong position internationally as there are only two Indian tankers, as compared to some 100 odd ones, the world over", he pointed out.

Also, the importer ends up paying the same landed cost, and it is the supplier who benefits, as carriage of cargo can be arranged on a competitive basis, said the official. "SCI is in a 'comfortable' position for the time being, but in future will have to struggle hard to get the contracts", he observed.

The importers are, on the other hand, in no mood to favour the national shipping lines. According to an FAI source, it is easier to make comparison between offers on c.i.f. basis, as the actual freight will be quoted. Whereas, on the f.o.b. basis it is not possible to make a comparison, particularly when suppliers are from different destinations.

India imports around one million tonnes of ammonia and 1.5 million tonnes of phosphoric acid. The landed cost of ammonia including the freight is around \$120 per tonne and that of phosphoric acid is around \$370 per tonne, of which the freight element is around \$40 per tonne for both.

India ranks 4th in world rubber output

India, Indonesia and Thailand all achieved record production levels last year in the natural rubber market, according to figures released recently.

The international rubber study group reported that rising production and falling consumption returned the world rubber market to surplus last year. Production rose to a record 5.38 million tonnes in 1991 from 5.21 mt in 1990, while consumption dropped to 5.23 mt from 5.24 mt.

A fall for Malaysia took it down from first to third place in the world output league, according to the London-based inter-governmental agency's figures. Its 1991 production figures in mt., with 1990 comparisons in parantheses, include Thailand 1.373 (1.271), Indonesia 1.352 (1.262), Malaysia 1.253 (1.292), India 360,200 (323,500) Nigeria 161,000 (152,000), Philippines 156,000 (168,000), Ivory Coast 76,000 (69,200), Vietnam 64,500 (60,000) and Brazil 35,000 (33,000).

Traders said rising output and falling demand from the recession-hit tyre industry had pushed the price of natural rubber down to a five-year low in January, but the market had recently started to improve. The upturn was the result of signs that Malaysian and Indonesian output will fall this year, because of low returns to farmers and adverse weather, *The Economist* intelligence unit said.

COST OF NATURAL RUBBER MAY GO UP STEEPLY

The cost of natural rubber to the consuming industry is likely to go up steeply imposing a heavy cost burden on those units whose main raw material it is, according to Automotive Tyre Manufacturers Association (ATMA). The government must look into this matter, said the Association in a press release. The Association has attributed four reasons to the cost increase. As against the fair price of Rs. 21,450 per tonne for natural rubber fixed by the government, the STC is releasing rubber at Rs. 26,000 per tonne.

While Kerala has increased purchase tax on the product from 9.3 to 10.8 per cent, the Central Government has moved a Bill in Parliament to increase the rubber cess collected from the consuming industry from Rs. 500 to Rs. 2000 per tonne.

The government is also actively considering a hike in the fair price y Rs. 2000 per tonne, according to an ATMA press release. In January 1991 the fair price for rubber was revised upward by 20.5 per cent from Rs. 17,800 per tonne.

STEEP RISE IN FERTILISER USE

Per hectare consumption of fertilisers for the country is estimated to have gone up from 37.00 kg (NPK) to 72.17 kg (NPK) between 1982-83 to 1991-92, the Rajya Sabha was informed on May 7th. The steps proposed to increase the production of chemical fertilisers in the Eighth Plan include completion of spill-over projects, started in the Seventh Plan, rehabilitation and revamping of old units, expansion of capacities in the existing plant and setting up of new plants, **Dr. Chinta Mohan,** Minister of State for Chemicals and Fertilisers told **Mr. Ram Naresh Yadav.**

The indigenisation achieved in fertiliser plants has been 66 per cent and 74 per cent in the public sector plant at Vijaipur and private sector plant at Jagdishpur respectively, the Minister said.

Besides availing of indigenous expertise to the fullest extent, there has been an impressive development of catalysts required in the fertiliser plants leading to self sufficiency in practically all types of catalysts the Minister said.

RAS Extrusions to go public

RAS Extrusions Ltd. which has tandem extrusion lines to manufacture five layer packaging films in one pass, using various substrates and lamination polymers, proposes to expand its facilities and go public later this year.

The company proposes to instal one adhesive/dry lamination unit and six colour gravure printing press with computerised controls. Other plans include establishing a cylinder engraving facility so that RAS becomes a complete flexible packaging unit catering to all types of laminates. The turnover is slated to reach Rs. 25 crores within two years.

During the period April 1, 1991 to March 31, 1992, the company expects a turnover of Rs. 5.50 crores with a cash profit of approximately Rs. 60 lakhs. No balance sheet loss expected for the year ending March 31, 1992, **Mr. Sameer Kaji**, President, said. The current capacity utilisation is in excess of 50 per cent. The break even point as is low as 28 per cent. There are only 22 tandem extrusion plants worldwide and RAS has been getting enquiries from global flexible packaging majors for sourcing supplies from the Indian company, Mr. Kaji said.

The company has been promoted at a capital cost of Rs. 5 crores by **Mr. Ambarish Kaji,** President of Asian Cables, a senior member of RPG group, along with **Mr. Bhagwan Thadani** and **Dr. Vikram Kaji.** Mr. Sammer Kaji, is the company president. ICICI and IFCI financed the venture by way of equity as well as loans. The plant is located 150 kms from Bombay.

COLLABORATIONS FOR IPCL, GAIL, RIL OKAYED

Three public sector petroleum companies will have technical collaboration with the US and French firms for pr ducing petroleum products. T Vadodra-based Indian Petrochemic Corporation Ltd., (IPCL) was giv consent to produce ethylene oxide ar ethylene glycol in technical collabor tion with a US firm — Scientific Desig Co.

IPCL will also collaborate wi another US company — Swec USA ar a French petroleum firm, Institute Fra cia du Petrol, to manufacture ethylen gas cracker with advance recover system. Another petroleum compan Gas Authority of India Ltd., will set u a gas cracker unit with technical co laboration with a US company, Ston and Webster Engineering Corporatio and a French petroleum firm Institut Francia du Petrol.

Reliance Industries Ltd., has bee given the green signal to produce sty rene and polystyrene in technical co laboration with the US firm, Lumu Crest Incorporated. In all, 68 foreig collaborations were approved in Febru ary this year. Countrywise, the Unite States leads the collaboration list wit 17, followed by Germany with nine, th United Kingdom six, Italy and Japa five each, Switzerland four, Belgiu and Sweden three each, France, Sout Korea, and the Netherlands two each non-resident Indians have two, whil Australia, Austria, Denmark, Duba Hongkong, Indonesia, Mexico an Taiwan have one each. Categorywise 42 technical transfers and 26 financia collaborations were approved involvin an investment of Rs. 408.16 crore i February alone.

JAIG POLYMERS PLANS EXPANSION

Jaig Polymers Limited, the company engaged in the production of disposable syringes, infusion and transfusion sets urine bags etc. has plans to expand its activities at its plant located at Jagdish- pur (U.P.) The cost of the expansion and diversification plan is estimated to be around Rs. 5 crore.

ANOMALY IN DECANALISATION POLICY:

High international diesel prices preclude possibility of import

A major "error", as claimed by the government officials, in the new import-export policy can throw the recently improved foreign exchange reserves out of gear. It has not happened so far for one reason. The international price of high-speed diesel (HSD) is higher than the domestic selling price.

The new import-export policy has decanalised import of HSD. This means that anybody can import it. With an established market in the country, all it requires to import is to lower international prices and set up a domestic distribution centre in the country. While the behaviour of international prices is beyond anybody's control, acquisition of a distribution centre shall not be a problem in this country.

The Finance Ministry has agreed to release foreign exchange for import of HSD, crude oil and kerosene at the official rate. When this was announced the Finance Ministry probably did not expect that the new policy would decanalise HSD. This means that any importer can claim foreign exchange from the Reserve Bank of India (RBI) for import of diesel at the official rate.

The HSD imports in terms of value account for almost 40 per cent of the total import bill of oil. In 1991-92 country imported HSD worth Rs. 7,000 crores while the total oil bill was around Rs. 18,000 crore. The government, however, continues to survive on sheer luck. The economics of import of diesel today does not work out.

The international prices are about Rs. 1,000 per tonne more than the administered HSD price in the country. The floodgates will open as soon as the international prices become lower than the domestic selling precisions of HSD from the list of goods canalised for imports. The highly-placed officials, however, evade answers to this. The Petroleum Ministry feels that the 'error' will be corrected. But, had it been an error, it would have been corrected by now. The policy was announced on March 31, 1992. It has now been several weeks that the "error" has not been corrected despite being brought to the government's notice.

One reason given for delay in "correction" is that the Commerce Ministry is waiting for the Parliament session to end. The Ministry does not want to face an embarrassment for issuing a correction in the newly announced policy. If this be the reason, the Ministry is taking a considerable risk. The Petroleum Ministry, on the other hand, is not equipped to ensure sale of HSD, if imported by someone other than IOC, within the administered price. The Ministry has never faced a situation like this before. It also does not know whether an importer will require Ministry's permission for setting up a dispensing unit for HSD. It also does not know if IOC can refuse HSD import because it is now decanalised.

The decision, if it was not an "error", for decanalisation of HSD was not in line with discussion held between the Petroleum Ministry and the Commerce Ministry as claimed by the former and denied by the latter. The Petroleum Ministry claims that the two sides had agreed to nine petroleum products in the canalised lists which included HSD and decanalise other 19 products. Besides HSD, other products which were agreed to be canalised were crude oil, kerosene, liquefied petroleum gas (LPG), petrol, aviation turbine fuel, bitumen, naphtha and furnace oil.

IOC EXPECTS TO NET Rs. 1,000 CRORE PROFIT

The Executive Director of the Indian Oil Corporation (IOC), **Mr. R.K. Jain,** has said that the corporation expected to earn a gross profit of over Rs. 1,000 crore during the year 1991-92, according to preliminary estimates. Mr. Jain told a news conference that the turnover of the IOC was also likely to cross Rs. 20,000 crore, the highest by any Indian company.

The corporation had earned a gross profit of Rs. 907 crore with a turnover of Rs. 19,482 crore during the previous year, he added. During the year 1991-92, Mr. Jain said, the corporation's product sale was expected to cross a record figure of 32 million tonnes. An additional tankage facility of about 60,000 kilo litres was commissioned by the corporation during the year, raising the total tankage capacity, to nearly 36 lakh kilo litres, he said.

Referring to the Rs. 1,500 crore prestigious Kandla-Bhatinda 1,331 kilometer long pipeline project, Mr. Jain said it was likely to be commissioned by June 1994. Mr. Jain said the Kandla-Bhatinda pipeline would pass through four district of Rajasthan, covering 716 kilometers, and three would be two tap off points alongwith marketing terminals at Sanganer (Jaipur) and Salawas(-Jodhpur) with a tankage capacity of 93,000 kilo litres and 74,000 kilo litres respectively.

MECON MAY GET SYRIAN CONTRACT

Metallurgical and Engineering Consultants (India) Ltd. (MECON) is expecting a prestigious consultancy assignment for a direct reduction-based steel plant in Syria. The company which signed a memorandum of understanding (MoU) with the Government, is already executing a consultancy and project management service contract for an integrated steel plant in Nigeria. Under the MoU, the targeted turnover for 1992-93 is Rs. 120 crores and a profit of Rs. 9 crores.

Ministry raps ONGC over Ravva field development financing

The Rs. 1,103-crore project seeking integrated development of the Ravva field, located in the shallow waters of the Krishna-Godavari baisn, has got embroiled into a controversy with the Petroleum and Natural Gas Ministry accusing the Oil and Natural Gas Commission (ONGC) of exceeding its financial powers while executing the first part of the project.

The Ministry has taken ONGC to task and sought a written explanation from it. The issue figured prominently in the Public Investment Board (PIB) meeting held to consider the project.

The bone of contention between the Ministry and ONGC is the way the latter has sought to implement the Phase I of the project by splitting it into six separate modules. ONGC has sanctioned each of these modules (known as Module I, II, III, IV, V, VA) separately under its delegated powers in February 1989.

However, since then, there has been an escalation totalling Rs. 30.41 crores in the cost of the modules that have been taken up for implementation. It was pointed out at the PIB meeting that the development of the six modules, under delegated powers was undertaken simultaneously, and not at different points of time, indicating that ONGC had broken down one large project into smaller parts just to bring them within its financial powers to avoid posing it to PIB.

It was also pointed out that since some investment has already been made in the project, other possible options like installation of offshore facilities have now been preempted. ONGC has already incurred an expenditure of Rs. 41 crores on this project so far. The cost of each well at Rs. 7.92 crores, it was felt, was "very high" compared to well costs in other recently approved projects. Further, a comparison of the item-wise costs in the feasibility report and the PIB Memo indicated that the cost estimation process was not correctly done, and that "there was some cushion built into the cost projected to the PIB."

According to informed sources, the ONGC Chairman reacted to the above criticism and stated that the initial work, after splitting the whole project into smaller modules, was taken up after informal consultants with the Ministry. However, according to indications available, no written record of the exact series of events which led to such decisions, is available on ONGC;s files.

He also admitted that some slippages and consequent escalation in costs have taken place even on the implementation of the modules. As regards other alternatives which could have been explored, he stated that onshore facilities would probably have been the best alternative anyway, since the mandate given to ONGC was to commence production from the field as early as possible.

Thanks to various problems, the commissioning of the first phase of the project will now be possible only in February 1993 against the target date of June 1992. The production potential of Phase I is estimated at 0.14 million tonnes.

The integrated project, as approved by PIB, would cost Rs. 1,103 crores, including a foreign exchange component of Rs. 710 crores. On completion, it would yield a production of 12.213 million tonnes of oil and 3.199 billion cubic metres of net saleable gas (both associated & non-associated) over a period of 14 years.

The Ravva field is located in the shallow waters of Krishna-Godavari Basin about five kms off Amlapuram. The field is a part of East Godavari sub-basin of Krishna-Godavari basin. The size of the Ravva field is about 100 sq. kms. The Ravva prospect was found to be oil-bearing in July, 1987. Following this discovery, exploratory efforts were intensified, which helped in establishing inplace reserves of oil and free gas of the order of 44.33 MMT and 5916.7 million cu.mts., respectively.

RINKI HYDROCARBONS TO EXPAND STORAGE FACILITY

Rinki Hydrocarbons Ltd. (RHL) engaged in re-refining used oils, storage and processing of chemical liquids on service-charge basis has planned the expansion of storage facility and also installation of special distillation plant. Talking about the storage facility, Mr. Gandhi opined that the project will be a total profit oriented unit as the company will store its clients' product at its risk. It will charge Rs. 100 per KL of oil it stores and will spend on the maintenance of the storing tank and testing the material in its laboratory. The companies, which make use of this facility include NOCIL and Reliance Petrochemical Ltd. who book the tanks on yearly basis.

RHL will soon export its technology to the US, says Mr. Gandhi. The company has already exported technology for manufacturing international quality automotive lubricants to Malaysia. It will also set up a similar plant in the USA and the company is negotiating with the party concerned, he said. "Foreign companies with similar technology are interested in setting up giant units while ignoring smaller units. Rinki group has tried to fill this lacuna and it has received enquiries from Nepal, Sri Lanka and Indonesia for its re-refining technology of speciality lubricants," Mr. Gandhi added. The sales figure for RHL is expected to show an increase of 30 per cent over last year's sales of Rs. 1.73 crores. The company expects to increase its net profit margin by 27.5 per cent over last year.

CIL proposal to set up power plants to be re-examined

The Union Government is considering afresh a proposal allowing Coal India Ltd. (CIL) to take up large thermal power projects at the coal pithead. This was disclosed in Calcutta on May 2, by **Mr. P.A. Sangma,** Union Minister incharge of Coal. The Minister made it clear that if CIL was allowed to take up power projects it would be done only for its captive consumption purposes.

Since there is a precedent of Neyveli Lignite Corporation (NLC) producing lignite and generating power on the basis of its own lignite, Mr. Sangma felt that there would be no major problem of allowing CIL to generate power at least for captive consumption purposes.

It might be recalled that Coal India had once decided to take up an integrated coal mine-cum-thermal power project, and for that purpose, a 10 million tonne-capacity Mukunda coal project was identified to be taken up with the help of the Soviet line of credits. The proposed project had subsequently been shelved due to various reasons, including the problem relating to quenching of under ground fires in the Mukunda coal block.

Addressing a press conference, Mr. Sangma said that CIL's Dankuni coal complex in West Bengal had been the victim of very poor offtake of coal gas by the Greater Calcutta Gas Supply Corporation (GCGSC), a West Bengal government undertaking.

GCGSC was yet to equip itself to draw coal gas from the complex as per its original commitment, thereby forcing CIL to run the complex with huge idle capacity. He, however, informed that a meeting had been convened on May 8 with the officials of CIL, GCGSC and the state government, to resolve disputes over fixing the selling price of Dankuni coal gas to GCGSC which has recently given an assurance to lift at least eight million cubic metres per day of coal gas from Dankuni complex by March, 1993 as against its present drawal of about 1.5 million cubic metres per day. **Mr. S.K. Chowdhary,** Chairman, Coal India Limited also participated.

Mr. Chowdhary, on the other hand, disclosed that CIL had a plan to set up a 30 MW capacity power plant on the basis of Dankuni coal gas. If the GCGSC fails to submit a "committed offtake plan", Coal India, in that case, might go in for setting up a power plant. The proposed coal gas based power plant would be set up in the state, and the entire generated power would be supplied to the state grid.

Mr. Sangma seemed to be determined to collect the entire CIL's outstanding dues of about Rs. 2,200 crores from the state electricity boards (SEBs). In reply to a question, he said that similar to "cash and carry system", introduced in October last, he was planning to introduce a system to realise the outstanding dues from SEBs.

Asked if he has plans to close down the uneconomic coal mines, Mr. Sangma said that he was finding it difficult to close down uneconomic mines in the wake of national compulsion to produce coal to cater to the requirements of the power sector.

He said that a total of 250 mines had been identified in September last year as uneconomic mines. Of these, a total 74 mines had earned marginal profit during the financial year ended March this year, thanks to the revision of coal prices.

The minister, however, said that his proposal to re-deploy surplus labour force in the existing mines in West Bengal had been accepted by the state chief minister, **Mr. Jyoti Basu.** As per his proposal, at least 70 per cent of surplus workforce should be re-deployed in the new coal mining projects, about 20 per cent of the workforce to be required in the new project would be recruited from within the state and the remaining 10 per cent of workforce in a new coal mine would be recruited from the dependents of the retired coal miners. He felt that other state governments should also accept his proposal to redeploy surplus workforce.

The minister did not think that the political changes in the erstwhile Soviet Union would affect the ongoing coal mining projects which had already been taken up under the Indo-Soviet trade protocol. He was confident that the financial assistance would continue to come from different republics under the Confederation of Independent States.

What he preferred was that the state owned undertakings like Heavy Engineering Corporation (HEC) and Mining and Allied Machinery Corporation (MAMC) should gear up their administrative network to produce substantial quantity of coal mining equipment, machinery and spares.

Domestic coal companies could place adequate orders to these companies provided they were ready to supply those equipment and machinery in stipulated time.

Rs. 32 CRORES BUSINESS AT HONG KONG LEATHER FAIR

India bagged business worth Rs. 32.22 crores in the International Leather Fair '92, held in Hong Kong from April 27 to 30, according to information received from India Trade Promotion Organisation sources.

Out of this, an order of Rs. 9.86 crores booked on the spot, while business under negotiation was reported at Rs. 22.36 crores. Besides, the appointment of agents and the negotiation for joint ventures were also reported.

Rs. 13,300 crore released for petro goods import

The Union Finance Ministry has agreed to allocate $5.1 billion (about Rs. 13,300 crores) at official rates to enable the Petroleum and Natural Gas Ministry to import HSD and SKO at 1991-92 level and 26.94 million tonnes of crude (against 24 million tonnes last year) during 1992-93.

It had earlier rejected the proposal for release of foreign exchange worth Rs. 16,800 crores for petroleum goods and crude imports.

In a major policy decision, the Ministry while approving the imports of other petroleum products such as furnace oil (0.150 million tonnes) LPG (0.450 m.t.), lubes (0.398 m.t.), benzene (0.120 m.t.), RPC (0.140 m.t.), paraffin wax (0.060 m.t.) and AV gasoline (0.003 m.t.) has, however, clarified that these will have to be financed through foreign exchange arranged at the market rates.

The Ministry has estimated that at the current level of prices, $5.1 billion allocated by it will be sufficient to provide fully for the import requirements of 26.66 million tonnes of crude oil and quantities of HSD and SKO which may correspond to a zero growth in consumption of these items over the 1991-92 level.

The Petroleum Ministry has been asked to restrict the import of HSD and SKO so that the total import bill for the three commodities (including crude) taken together does not exceed $5.1 billion. If either crude oil prices or other product prices soften over the present level, the relief thus obtained can be used to import HSD and SKO up to 7.301 million tonnes and 3.316 million tonnes respectively.

However, if prices harden, the quantities of HSD and SKO imported would have to be adjusted to ensure that the total ceiling of $5.1 billion is observed. While the Finance Ministry wants to keep the import at the last year's (1991-92) level, the Petroleum Ministry had envisaged a growth rate of 10 per cent and proposed the import of 4.210 million tonnes of SKO against 3.317 million tonnes in 1991-92.

In the case of HSD, the Ministry had asked for import of 7.760 million tonnes the actual import of commodity adding to 5.07 million tonnes last year. Though the allocation for import of the three select commodities in rupee terms at Rs. 13,300 crores is about Rs. 600 crores more than the last year's figure of Rs. 12,672 crores (for crude and all other petroleum products), in dollar terms it remains at almost at the 1991-92 level.

The value of imports of crude and all other petroleum products last year added to $5001.55 million.

In the last year's import bill the three select commodities crude, SKO and HSD accounted for $3000.90 million, $708.43 million and $1029.02 million, respectively. The share of other petroleum products in the import bill added to $263.20 million or Rs. 680 crores (as per the then prevailing official exchange rate).

The quantity of these other items was 0.700 million tonnes. This year, the Petroleum Ministry has already got the Finance Ministry's nod to import 1.521 million tonnes of petroleum products, (in addition to the select three) i.e. twice the quantity over the last year's level of 0.700 million tonnes.

Not only that, the quantity to be imported will be double (over the last year's level). Foreign exchange will also have to be arranged at the market rate which is higher than the official rate. Even if the price of these commoditi stays at last year's level, their import b this year will be more than double ov the previous year's.

EX-BPCL CHIEF JOINS RIL

Mr. R.K. Gajree, ex-chairman Bharat Petroleum Corporation L (BPCL), is the latest in the long line former bureaucrats who have join Reliance Industries Ltd (RIL).

He is reported to have joined as consultant but is expected to overs RIL's nine million tonne refinery pr ject, the application for which is pen ing with the government.

Interestingly, during Mr. Gajree tenure as chairman of BPCL, RIL wa talked of as the joint sector partner fo BPCL's three million tonne refiner expected to come up somewhere Central India.

With RIL now announcing its plan to go ahead with a refinery project pr bably with a foreign partner, BPCL now expected to implement its secon refinery project on its own. Informe sources say that the government expected to clear BPCL's refiner project in the near future.

AMRAPALI INDUSTRIES TO DIVERSIFY

Amrapali Industries Ltd. (former known as Amrapali Synthetics Ltd engaged in the manufacture of texture yarn, is diversifying into the field luxury grade laminated sheets.

The plant, being set up in Ahmed bad district, will have the capacity manufacture 9,21,600 sheets per annun It will have the latest machinery of Ja anese and German makes. In order part finance this diversification, th company proposes to enter the capit market soon, subject to clearance b various authorities.

Broad-based fuel strategy for transport sector mooted

Oil experts predicting a deficit of 65 million tonnes per annum in petroleum products by the year 2005 have called for a broad-based strategy to introduce alternative fuels in the transport sector. 'Such changes would probably not take place cheaply, easily or even quickly, but the stakes involved suggest that they ought to be considered seriously,'' say scientists from the Indian Institute of Petroleum (IIP), Dehra Dun.

India's unique pattern of fuel consumption, with diesel consumption outstripping that of petrol, is just the reverse of fuel patterns in other countries. This calls for a 'unique Indian solution' which targets on diesel substitution, IIP scientists say. With the demand for diesel six times higher than that of petrol in India, the country's import bills on diesel alone run up to Rs. 3,000 crores every year.

The diesel demand is expected to shoot up, with six million four-stroke engine vehicles and 35 million two-stroke engine vehicles estimated to hit Indian roads by 2005.

By then, the total demand for petroleum products is expected to touch 120 million tonnes, and the country's production only 55 million tonnes, leaving a gap of 65 million tonnes. The demand for diesel by 2005 is anticipated at 55 million tonnes.

IIP's alternative fuel strategies aim at partial or total replacement of diesel in the transport sector. At present, they say, there are two viable alternatives —compressed natural gas (CNG) and alcohol. Hydrogen energy, which is one of the alternatives suggested 'will have no meaning till at least 20 years,' says **Mr. P.V. Krishna,** former industrial advisor to the Government of India. Vegetable oils too are not an economically feasible option. Trial runs of some vehicles operating on CNG have already been intensified and studies are under way on indigenisation of CNG kits, cylinders and filling stations. IIP scientists list several advantages of CNG: it can partially or totally replace diesel consumption, it has a lower visible smoke emission and leads to a cleaner environment.

Also the Government has studied an action plan for the introduction of CNG as an automotive fuel in transport vehicles at selected localities in Assam, Tripura, Delhi, Bombay and Gujarat, and has approved of the first phase of conversion of 220 petrol powered vehicles on an experimental basis.

New auto-kit saves 20% diesel

IIP scientists have developed an alternate-fuel device that substitutes 15 to 20 per cent of diesel with alcohol either methyl or ethyl alcohol. The IIP device is to be launched commercially by a Gujarat-based firm in three months. Introduction of the device in heavy vehicles in the transport sector could save at least Rs. 300 crores worth foreign exchange spent every year on diesel imports, **Mr. K.K.Gandhi** and **Sudhir Singhal,** members of the IIP team that developed the gadget said.

The gadget, which is priced at Rs. 16,000, is expected to save one-tenth of the foreign exchange outgo on import of diesel. According to IIP scientists, the kit has proved successful in field trials involving about 100 heavy vehicles which together covered nearly 50 lakh km in Delhi, Maharashtra and Dehra Dun. The gadget contains a tank which can carry 200 litres of alcohol and a fuel pump that injects controlled amounts of the alcohol into the engine which is also separately fed by a diesel tank. It has been designed so simply that it can be maintained by any roadside garage of state transport undertakings (STUs) workshops, IIP scientists said.

Proposal to revamp ONGC, OIL

The Minister of State for Petroleum and Natural Gas, **Mr. S. Krishna Kumar,** has recommended that the structure of Oil and Natural Gas Commission (ONGC) and Oil India Limited (OIL) be changed, and emphasised the need to promote the private sector in the two central public sector undertakings (PSUs).

Mr. Krishna Kumar has highlighted the need for the setting up of small joint sector organisations to manage some of the oil fields which are marginal in terms of economic performance. Citing the example of the North Sea oil field in Great Britain, he pointed out that for every 250 kms, the development activities were being undertaken by a different multinational corporation. This was the way to follow, he suggested.

His recommendations came at a round table discussion organised recently by the Tata Energy Research Institute (TERI) on a hydrocarbon exploration and development strategy for India. The round table meet recommended that the system of rounds of bidding should be scrapped. Instead, it suggested, the setting up of an empowered committee to take decisions on bids as and when they were received.

It was also felt that there should be a major step-up in both survey and exploration activities and private of joint sector participation ought to be encouraged on terms that are on par with those offered to foreign oil companies. Besides, the reserves-to-production ratio should be brought down to atleast 15:1 in the near future in an effort to reduce dependence, experts opined.

On the government's role, many of the participants felt that it should be restricted to policy-making. There should be no involvement in commercial decisions and project approvals should be speeded up substantially, it was felt.

ONGC EXPLORATION IN CAMBAY GULF BEGINS

The Oil and Natural Gas Commission has begun drilling in the Gulf of Cambay with the spudding of a well by the offshore rig Jupiter. Initially four exploratory wells are to be drilled at an estimated cost of Rs. 72.96 crore. Oil drilling in the region along with the announcement of the fourth round of bidding for exploration by foreign and private Indian companies is expected to improve prospects of crude oil availability.

Expected production from the Gulf of Cambay will help the country to achieve greater self-sufficiency at a time when it is spending as much as Rs. 13,000 crore per annum on crude and petroleum product imports. According to the ONGC, the spudding of the well marks a new chapter in the oil exploration scene of Gujarat. It was at Lunej, near Cambay, in 1958 that oil was first struck. Since then, the Cambay basin has been intensively explored. Over 2,800 wells have been drilled resulting in delineation of over 77 oil and gas fields.

Exploration trends indicate that the basin is fast approaching maturity and scientists believe that only 54 per cent of the prognosticated reserves have so far been converted into geological reserves. Cambay basin continues to be considered a low risk area for oil exploration.

During the Eighth Plan, 24 wells are proposed to be drilled in the area which may result in accretion of 44 million tonnes of oil reserves. An ONGC release says the prospects of the Arabian Sea in the vicinity have been of interest to oil experts for a long time. In 1964, seismic surveys were conducted in the Gulf of Cambay, Madras offshore and other areas.

French team to assess oil find in Bengal

A team of French oil exploration technologists will make an on-the-spot assessment of the hydrocarbon zone struck by the Oil and Natural Gas Commission, at Ichhapore in Nadia district of West Bengal.

The team, possibly from the well-known Butanol Group, will examine the oil exploration data, oil samples, the pressure built by the natural gas layer above the oil-strata and estimated oil reserves of the 24th well and other prospective wells around it.

The experts are likely to be in India by the month-end, according to the sources in the ONGC regional directorate (RD). ONGC officials informed West Bengal chief minister **Mr. Jyoti Basu** of the oil strike. The oil was struck on April 20, 4,346 metres below the ground level (BGL), ONGC-RD officials on the condition of anonymity said there was a bright possibility that another rig in the vicinity of the 24th well would give more encouraging results.

The oil-bearing stratum between 4,346 and 4,369 metres BGL has a layer of natural gas creating high pressure, which is hampering crude extraction. More than 40,000 cu metres of gas has been forced out and burnt to help accelerate the process of oil extraction. The decision to commission the French exploration organisation is a sequel to the spot visit by two ONGC members, **Mr. L.L. Bhandari,** incharge of drilling, and **Mr. S.S. Paintal,** incharge of operations.

Mr. Bhandari and Mr. Paintal had visited Ichhapore in April-end. Surprisingly, they had kept mum about the oil strike as the samples, some of which were exhibited at a press conference recently by state CITU general secretary Chttabrata Majumdar, were of a rare type and potentially better crude than the Bombay High. Basin experts, associated with the Keshav Deo Malaviya Institute of Petroleum Exploration, hoped that the Ichhapore crude could be at par with the Australian crude.

The first director of the institute, **Prof. Hari Narain,** had earlier suggested that keeping in view the enormous effort that has gone into the Bengal Basin exploration, the ONGC should go slow and undertake a detailed, independent evaluation of the entire data acquired over the years. The evaluation would help finding the gaps in the data and also identify the areas which need to be surveyed and from where the data is poor, Prof. Narain added.

In 1970, Carlsberg group from US did an offshore exploration and inferred that possibility of oil being struck in the Bengal Basin was very low. But a conference of geo-scientists, drawn from ONGC and other institutions, was of the opinion that there were plenty of hydrocarbons in the Bengal Basin.

ONGC experts at Ichhapore are sharply divided over the real intention behind the embargo on the entry of geologists, geophysicists and newspersons into the Ichhapore exploratory region. We do not know why the French experts have been commissioned when we have many eminent experts within India who can assess the quality of oil and can estimate the hydrocarbon reserves in the region, an ONGC official quipped.

ONGC PROPOSAL TO CHARTER FOREIGN RIGS TURNED DOWN

The Ministry of Petroleum and Natural Gas has turned down the Oil and Natural Gas Commission's proposal to charter five foreign owned jack-up rigs, putting an end to all the controversies in the multi-million dollar contract. The Indian oil industry had also criticised the ONGC move and made various representations to the Government in this regard.

However, to ensure that ONGC's exploration work does not suffer, the Ministry has directed it to extend the existing contracts by just six months. Here too, the Ministry has stipulated that the new hiring charges to be paid to these vessels should not be more than the rates being paid to Indian-owned drillships. The present difference in the rates being paid to the two categories are over Rs. one lakh per rig per day.

ONGC, in its original proposal of December 30 last year and through subsequent reminders of January 10 and March 11 last, were keen on pressing the Ministry for accepting higher rate for foreign flag jack-up rigs. This led to persistent protest from the indigenous shipping and oil industry on the price discrimination loaded in favour of foreign vessels.

In a strongly worded letter, sent to ONGC recently, the Ministry has said, "In this connection the Minister has minuted that Category II rigs (foreign owned but leased through Indian parties) may not be allowed to have any differential treatment. ONGC should ensure that the above order of the Minister are scrupulously followed."

What, however, comes as the surprise to many in the oil industry is that why ONGC could not take up such a negotiation (of lowering the rates) and save the country millions of dollars in much-needed foreign exchange. The conviction that ONGC could have achieved the desired results has been reinforced by the news that these rigs would come around to accept the lowest rates which were offered to Indian owned rigs (Category III).

The five in this context are: Norbe II and Norbe V (leased through Jagson International), Dual 38 and GMP III (leased through Shipping Corporation of India) and D.R. Stewart (offered directly by Reading and Bates of USA-Category I). According to the rates recommended by the ONGC, the foreign owned assets could have cost millions of dollars more.

ANNUAL REPORT OF MINISTER OF PETROLEUM & NATURAL GAS:

Crude output down, natural gas supply up

A substantial increase in supply of natural gas, 102 per cent capacity utilisation of 12 refineries and fall in crude oil production have been highlighted in the annual report of the Ministry of Petroleum and Natural Gas for the year 1991-92, released in New Delhi on May 12.

The supply of natural gas rose to 12 million cubic meters as against 7.6 billion cubic meters in the preceding year. The refineries processed 51.77 million tonnes of crude oil against the target of 51.18 million tonnes (MTPA). However, the production of crude oil in the country during 1991-92 was about 30.34 million tonnes as against the production of 33 million tonnes in 1990-91. The shortfall in crude production was on account of various reasons such as reservoir constraints, slippages in projects, agitations and oil blockade. During the year (April-December 1991) oil and gas were discovered at 11 places.

The major projects approved during the year, according to the report were:

* Setting up of a new 3 MTPA refinery at Mangalore in a joint venture between HPCL and Indian Rayon and Industry Limited. The approved cost of the project is Rs. 1,160 crore with a foreign exchange component of Rs. 300 crore.
* Expansion of the capacity of Cochin Refinery from 4.5 MTPA to 7.5 MTPA at a cost of Rs. 481.24 crore with a foreign exchange component of Rs. 24.92 crore.
* The Bongaigaon refinery expansion from 1.35 MTPA to 2.35 MTPA was approved. The cost of the project is estimated at Rs. 222.99 crore with a foreign exchange component of Rs. 31.98 crore.

Also undertaken was the expansion of the Koyali refinery by three million tonnes. The setting up of grass root refineries at Numaligarh in Assam and Karnal in Haryana, are also under consideration. The oil industry had set a target of enrollment of 10 lakh new LPG customers during 1991-92.

Consequent to the decision to disinvest government shareholding, about 10 to 13 per cent of shares in Hindustan Petroleum Corporation Ltd. (HPCL), Bharat Petroleum Corporation Ltd. (BPCL), Madras Refineries Limited (MRL), Cochin Refineries Ltd., (CRL) and Bongaigaon Refineries and Petrochemicals Ltd. (BRPL), have been disinvested.

The public sector undertakings in the oil sector during 1990-91 earned Rs. 2,302 crores in profit after tax in 1990-91. The profit before and after tax during 1991-92 is estimated to be Rs. 2,546 crores and Rs. 1,795 crores respectively. The price of natural gas has been revised with effect from January 1992 to Rs. 1,550 per 1,000 cubic metres at landfall point or well head.

The price of gas in the North eastern region was, however, maintained at Rs. 1,000 per cubic metres but the discount available on this price was revised to Rs. 400 per 1,000 cubic metres on a case to case basis.

During the year, the Ministry negotiated and finalised several loans from multilateral agencies for the development of the hydro-carbon sector and for certain projects of the ONGC.

A loan of US $450 million was negotiated and finalised with the World Bank for the Gas Flaring Reduction Project of ONGC. A loan of US $267 million was negotiated and finalised with the Asian Development Bank.

Chevron signs oilfield development pact with Kazakhstan

Chevron Corporation, the fourth largest US oil company, has signed a long-awaited agreement with the republic of Kazakhstan that could lead to a multi-billion dollar development of one of the world's largest new oilfields. The deal is the most significant venture agreed between a western oil company and the authorities in the former Soviet Union and offers encouragement to many other companies currently embroiled in negotiations.

The company said that after four years of negotiations it had signed a protocol for the creation of a joint venture in the Tengiz area. The Tengiz oilfield near the Caspian Sea is estimated to contain as much as 25 billion barrels of oil-equal to the size of Saudi Arabia's entire oil reserves. Chevron said that when work began on the project, it would involve an initial investment of $1.5 billion by the venture partners over the first three years. The company gave no timetable for the project.

Reports of the deal in the Russian press say that 80 per cent of the profits from the venture would be allocated to Kazakhstan. A previous deal over Tengiz which Chevron had tentatively agreed on two years ago came in for fierce criticism from the Russian press for selling natural resources too cheaply. That deal was believed to involve a 28 per cent profit margin for the US company. **Mr. Kenneth Derr,** Chevron's Chairman, said: "We are pleased that after long discussion we've reached this breakthrough". The company returned to the negotiation table late last year once the break-up of the former USSR was underway, transferring power over resource deals to the governments of the republics. Mr. Derr said the agreement covers the Tengiz field, the Korolev field and an exploration area extending over 4,000 sq km. The Tengiz field contains oil at very high pressure with a high sulphur content.

For this reason, it will be expensive to exploit and demands sophisticated technology not available in the former USSR. Estimates for the amount of oil that can be recovered from the 25 billion barrels of reserves run at three-four billion barrels. The deal is also believed to include the construction of an oil pipeline to one of the Black Sea ports.

Mr. Derr said in a recent interview: "From our standpoint, it's a very high risk deal, but the size of it is unique and it could have a meaningful impact on a company of our size for a long time".

The joint venture is expected to be in place for 40 years and is widely regarded as a showcase deal. Mr. Edward Shevardnadze, former Soviet Foreign Minister, said last year: "It is no secret that the US will judge our readiness to co-operate by the success or failure of this project". Wall Street took a positive view of the venture: 'It will have no major impact on earnings for three to four years", said Mr. Paul Mlotok at Morgan Stanley, "but getting access to 25 billion barrels of oil has got to be a big plus".

'ECOMARK' SCHEME COMES INTO FORCE

The Ecomark scheme for labelling the products as environmentally friendly has come into force for soaps and detergents. The final notification in this regard has been issued by the Ministry of Environment and Forests. The Ministry had issued the preliminary notification in November last year inviting objections on the criteria notified, according to an official release. Soaps covered under the scheme are the anti-bacterial toilet soaps, liquid toilet soaps, baby toilet soaps, transparent toilet soaps and shaving soap.

Patentability of living organisms under study

The Department of Biotechnology (DBT) is examining the issue of patentability of living organisms as proposed in the Dunkel draft says a report in *The Business & Political observer*.

The standing committee, set up by the Department at the request of the Ministry of Commerce last year for considering issues specific to biotechnological inventions, expressed the view that the DBT has recognised "the need to achieve a degree of parity in international terms in the field of IPRs in the context of projected new economic order and marketed created mechanisms in international trade and technology appropriate to the vast opportunities."

The committee, which has had four meetings so far, is examining whether the existing Indian patent system is flexible enough to accommodate developments in the area of biotechnology. The committee is expected to finalise its recommendations in another four months, official sources said.

The committee had circulated a questionnaire among all parties concerned, including industry apex bodies, to elicit their views on the subject. The views expressed by the respondents will be considered while finalising recommendations of the committee.

At present, the Indian patent laws do not allow patenting of living organisms, but biotechnological processes based on life forms can be patented. The only exception made till now is in case of the yeast organism used in food processing industry.

DBT scientists, connected with the committee, said objective of the panel is to suggest means to ensure sufficient investments in R & D, growth of indigenous industry and sufficient protection to public interest and national interests.

The committee has made some recommendations on protecting the interests of scientists, suggesting that inventors should be paid a greater part of the royalty accruing out of commercial usage of the product or process developed by them. Incentives should also be given to entrepreneurs for taking up commercialisation of new products and processes developed, using biotechnology.

The thrust of biotechnology development in the country, according to the committee, should be to capitalise on scientific, technological and human resources to promote innovative R & D and technology development, leading to patents. A scientist's performance should be judged by the number of patents produced by him.

Several public interest groups, notably the Gene Campaign, have opposed the idea of allowing patents of living organisms and genes and have urged the government to protect plant breeders' rights.

The issue has reached a flashpoint in the US, with a move by National Institute of Health to patent certain human genes, threatening the very future of the $3-billion project to map the human geneome.

PRADEEP DRUGS PLANNING FOR FDA APPROVAL

Pradeep Drug Company Ltd., a manufacturer and exporter of bulk drugs such as erythromycin salts, sulphasomidine, mebendazole etc., is setting up a 100 per cent export-oriented unit (EOU) near Madras for the manufacture of bulk drugs such as analgin, furosemide and mebendazole at an estimated cost of Rs. 5.3 crores.

Speaking to reporters in Calcutta recently, Mr. S. Mohanchand Dadha, managing director, said the EOU woul[d] manufacture 360 tpa of analgin, 60 tp[a] of mebendazole and 36 tpa of furose[mide]. He said the entire production fro[m] the plant would be exported.

Pradeep Drugs already has regula[r] dealings with a large number of buyer[s] in the global market. The compan[y] exported bulk drugs worth Rs. 4.9[?] crore during the 10 months ended January 31, 1992.

The export of bulk drugs has bee[n] increasing rapidly as foreign buyers fin[d] Indian drugs cheaper owing to the lo[w] production costs here. For example erythromycin was selling for dollar 7[?] a kg in the US while the same was being exported from India at dollar 64 a kg.

Mr. Dadha said foreign buyers, with whom the company was dealing with currently, had expressed their desire to lift the entire ourput from the EOU. In fact, two overseas buyers, including one based in Denmark, had committed themselves to lifting about 90 per cen[t] of the production from the EOU.

He said only 15 per cent of the raw material required to manufacture the bulk drugs would have to be imported. The value addition to the same would result in substantial export earnings.

Mr. Dadha said the Super and Special 301 provisions of the US Trade and Competitiveness Act as well as the Dunkel proposals would not affect the company as all the products being manufactured and proposed to be manufactured were already out of patent.

However, the company had applied for approval of its manufacturing facilities by the US Food and Drug Administration (FDA) and the same would be accorded to it after the plant commenced production and the FDA team inspected the manufacturing facilities.

Industrial houses urged to encourage science

Prime Minister **Mr. P.V. Narasimha Rao** recently emphasised the need for application of science at the grassroot level and encouragement of research and development by industrial houses.

Giving away the first B.M. Birla science prizes in New Delhi, he said that pure science needs to be given greater encouragement which had not been done so far and in this the industrial houses had a role to play even though the profits from it may take time to come.

The Prime Minister said that industrial houses should tie up research and development with educational institutions and people as was being done in developed countries. He added that he would be looking into this aspect when he visits Japan shortly.

He said that industrial houses, apart from starting educational institutions, should also draw up research and development programmes which would be responsive to the needs of the people specially at the grassroots level.

He said that research and development was the umblical cord between education and science and this has to be strengthened. Scientists were great assets to the country and it remained to be seen how their knowledge was transplanted in society and at the grassroot level, he added.

He said that government and institutions would have to give greater thought to this and find the link for the application of science. He said greater encouragement needs to be given to basic pure sciences.

Speaking on the occasion, Andhra Pradesh Education Minister **Mr. P.V. Ranga Rao** praised the role played by the Birlas in the industrial development of the nation and their contribution in various other fields. **Mr. B.M. Birla** was a leading captain of industry who was described by nobel laureate William Fowler as equal to Thomas Jefferson of the United States. In his welcome address, Mr. G.P. Birla hoped that the prize would inspire and encourage young scientists in the country to scale higher heights.

INDIA TO INSIST ON BIOTECHNOLOGY TRANSFER

India will remain firm on its stand that access to biomaterial in developing countries has to be linked to transfer of biotechnology to them from developed countries, in the final round of negotiations for the convention on biodiversity which began recently.

The issue of intellectual property rights (IPRs) could be resolved by providing compensation to multinational corporations which hold patents for biotechnological processes. This was stated in New Delhi recently by Minister of State for Environment and Forests **Mr. Kamal Nath** at a workshop of non-government organisations (NGOs) organised by his Ministry to discuss issues before the next month's UN Conference on Environment and Development.

The Minister said the results of research and development using biomaterial from tropical forests and the resulting commercial profits should be shared equitably among the countries involved. Referring to the framework convention on climate change negotiated recently Mr. Kamal Nath said: "Our concerns voiced in various negotiating fora appear to have been adequately met, although we are still examining the final text". He said India had always insisted that the greenhouse effect was a result of excessive emissions from developed countries. Despite this, developing countries could initiate steps to reduce emissions if funds were made avaialble to them. Reviewing the environmental scenario in the country, the Minister said environment protection could not be achieved by regulation alone. People's participation in this task was necessary and NGOs could play a major role in this regard.

He said most of the state governments perceived the Environment Ministry as an agency opposed to development projects, but they failed to realise that the steps it initiated were necessary for sustainable development. While implementing environmental laws, he said, one must take a realistic approach. "Closing down 60 per cent of the industries which are polluting or scrapping all buses and cars emitting excessive emissions will not solve the problem."

He said his Ministry would like to have constant dialogue with NGOs on various issues and government policies. He wanted a plan of action to be drawn up for enhancing links between NGOs and the Ministry.

SKYLINE GROUP TO SET UP LEATHER UNIT

The Skyline group of companies, chiefly in the construction business, is diversifying its operations, with the setting up of a leather shoe unit, Skyline Leather Industries Limited, at Ranipet, near Madras at a cost of Rs. 11.20 crore. A buy-back arrangement with its technical collaborator, Lampo-machine International SRL of Italy, has also been entered into while potential foreign markets for the remainder are being explored, according to **Mr. Peter JR Prabhu,** chairman, Skyline Group.

The leather company would also be entering the capital market in a few months with a public issue aggregating Rs. two crore. The unit is also being financed with a share capital of Rs. 2.80 crore brought in by the promoters, term loans of Rs. 6.40 crore from the IDBI and commercial banks.

Coal output may touch 293 mt. by 1996-97

The Ministry of Coal has proposed a production plan of 237.09 million tonnes in 1992-93 after having reached a production level of 229.29 million tonnes during 1991-92 against a target of 228.00 million tonnes. The production of coal is expected to touch 293.21 million tonnes by 1996-97, according to the annual report of the Ministry.

The report said that the ministry had been able to meet the coal demand more adequately with the Coal India Ltd. achieving highest-ever growth in loading wagons during 1991-92. The despatches to power utilities increased from118.77 mt. in 1990-91 to 136.88 mt. during 1991-92, recording a growth rate of over 15.2 per cent.

To achieve productivity comparable to international standards, and to improve the quality of coal, working groups at government level with erstwhile USSR, Poland, the UK, France, Germany, Canada and Australia proved a great success, the reports said.

During 1991-92, four coal mining projects had been sanctioned. These projects had a raw coal targeted capacity of 18.10 million tonnes per year. During 1991-92, 0.1145 million tonnes of coal had been exported as against 0.095 million tonnes during 1990-91. As on January 1, 1992, the coal resources have been estimated at 1,96,022.90 million tonnes. The cash and carry scheme of power houses introduced in 1991 had substantially improved the liquidity of Coal India. The sales turnover stood at Rs. 503.72 crores in 1991-92 as against Rs. 470.88 crores in 1990-91.

According to the report, the Ministry had estimated raw coal demand in 1992-93 at 247.30 million tonnes and in 1996-97, the terminal year of the Eighth Plan, at 307.50 million tonnes. The Planning Commission had, however indicated a coal demand of 254.50 million tonnes in 1992-93 and 309.20 million tonnes in 1996-97. The production for Neyveli Lignite Corporation for 1992-93 was 13.30 million tonnes, the report added.

FICCI FOR DUTY FREE IMPORT OF COAL

The Federation of Indian Chambers of Commerce and Industry (FICCI) has urged the Government to allow industrial units duty free import of coal to tide over the persistent coal shortages being faced by them.

In a communication to Finance Minister, **Dr. Manmohan Singh,** the FICCI President, **Dr. V.L. Dutt,** said all industrial units with an average coal requirement of 2500 tonnes per month and located within 100 km of the coastline anywhere in the country other than West Bengal, Orissa and Andhra Pradesh should be permitted duty free import of coal.

Dr. Dutt said the landed cost of imported coal at the current import duty of 85 per cent would work out to Rs. 2900 per tonne against Rs. 1600 per tonne of indigenous coal. This factor alone has hiked up the cost of production of many industrial units. Added to this, there was considerable delay in wagon movement that has created bottlenecks in supply position of coal, a release said. Dr. Dutt said the 'grim situation' of coal shortages was not likely to show any improvement in near future. Therefore, industry has to necessarily depend on imported coal on a regular and continuous basis to realise its full potential.

Industry could do this only if the Government allowed duty free import of coal. The return in the form of higher production and, therefore, higher excise revenue and export earnings would more than cover loss of customs and foreign exchange. Dr. Dutt said persistent coal shortages have critically affected industrial growth, particularly in the western and southern states, including Gujarat, South Karnataka and Kerala. Most industries were receiving only 20 per cent of their coal requirement. If the situation continues, many units will be forced to close down putting at stake large number of employees and industrial growth in general, he said. Dr. Dutt said a perspective plan should be drawn up for mitigating the mismatch between demand and supply of coal.

STRESS ON UNDERGROUND COAL MINING

The Coal Minister, **Mr. P.A. Sangma,** said the Government wanted to lay more importance to the underground mining compared to the opencast as the latter was "unfriendly towards the environment" though it contributes to the production of more than 70 per cent of the crucial input for industrialisation.

Delivering his valedictory address in the two-day international seminar on the "Roof support technology" at Calcutta, on May 8, Mr. Sangma said the Government wanted to lay special stress on underground mining to have better quality product which would meet the consumers requirement and added that they wanted to double coal production from underground mining by the turn of the century. He said now production from the underground mines was nearly 60 million tonnes and pointed out that the production level was stagnating for nearly two decades. He, however, said the Government could not help but getting production from opencast mines because of the rising demands of the crucial commodity. He said the Government would appreciate finding suitable technology which would make the underground coal mining cost effective and less prone to accident. The accidents in the underground mining were a matter of grave concern though the cases of such incidents was declining. The Government wanted it to bring a zero-death situation in the underground mining, he said.

Tamil Nadu yet to tap fully wind energy potential

Tamil Nadu, which has exhausted most of its viable hydel power potential and faces difficulties in expanding its thermal capacity, now looks to wind energy as a non-conventional alternative to bolster its energy resources. But the State is far from tapping its full potential.

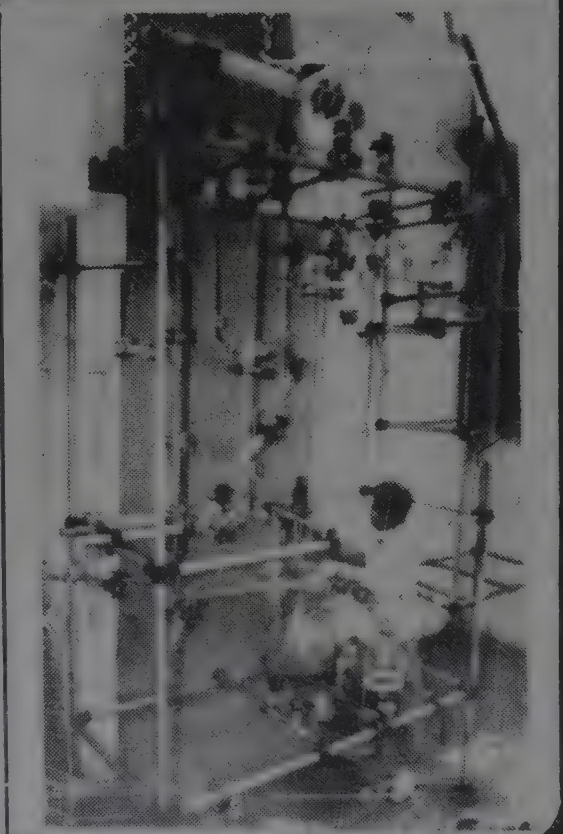
As against a total wind energy potential of 2000 MW in the State, the present installed capacity of the wind farms is only 15 MW and the total output supplied to the Tamil Nadu Electricity Board (TNEB) has been 69 million units. "The real need is to make these windmills cost-effective and fully indigenise their functioning", says **Mr. K.A. Sundaram,** Chairman of the Tamil Nadu Energy Development Agency (TEDA), the State's promotional agency for non-conventional sources.

For an installed capacity of one MW through wind energy, the cost was about Rs. 3.50 crores, as against Rs. 1.5 crores for a thermal station and a third of that for a hydel station, Mr. Sundaram said. Tamil Nadu has an excellent wind regime, served as it is by several stretches of hilly terrain. Sites are available for setting up wind farms with a total capacity of 500 MW, and TNEB has proposed to set up 100 MW in the Eighth Plan period.

The World Bank has already undertaken an appraisal for extending a loan for wind farms with 75 MW capacity. Mr. Sundaram is confident that at least 10 MW would be added to the State grid by March next. This would include the setting up of another wind farm, the third major wind farm in the State at Kethanur in Coimbatore district. The farms at Kavathar in Chidambaranar district and Muppandal in Kanyakumari district are the major contributers to the grid. The Centre's Department of Non-conventional Energy Sources (DNES) will undertake a major portion of cost of commissioning it. Tamil Nadu, which along with Gujarat is the current leader in wind power generation in the country, encourages the private sector to set up wind farms. Presently, 5 MW capacity is in the hands of private entrepreneurs.

Much of the windmill equipment presently installed in the State has been imported from Denmark, while generators are from other countries like Holland, Germany and Japan. Though the Centre has licensed a few Indian companies for making generators and these had acquired the experience and expertise to erect and maintain wind mill generators, a large number of wind mills are still non-indigenous.

The only way to cut down cost on wind energy is 'mass production' Sundaram said, but added that it was impossible now. However, with electricity connections in the rural areas becoming difficult to get and diesel costs being high, more and more people are interested in wind mills, he said.



MADHYA PRADESH AWAITS OKAY FOR GAS-BASED POWER PROJECT IN GWALIOR

The Madhya Pradesh Government is awaiting the Centre's clearance for setting up of a gas-based power plant in the Gwalior district of the State. Official sources said that if the clearance for the plant was not given soon, the State would face a shortfall of 25.9% in its electricity requirement during 1994-95, adding that it would go up to 35.23% in 1999-2000. The plant, needing 4.00 million square metres of gas per day, was found to be worthy of clearance by the Central Electricity Authority, the sources said, adding though recommendations were sent to the Union Energy Ministry for its setting up, lack of gas supply was the main impediment.

Hindustan Dorr-Oliver ties up with Buss AG

Hindustan Dorr-Oliver Ltd. has entered into a technical and representation agreement with Buss AG of Switzerland. The agreement will be covering specialised equipment and technologies of Buss's process technology division based at Basel, Switzerland.

EOU for speciality chemicals

On the diversification front, Hindustan Dorr-Oliver is in the process of negotiating with foreign collaborators for the manufacture of speciality chemicals with agrobased raw materials. The company plans to set up an export oriented unit (EOU) for the purpose, which will be a separate division and the investment plan is between Rs. 45 and Rs. 50 crore.

Talking to newman, **Mr. K.P. Mohandas Rao,** Managing Director, said that Hindustan Dorr-Oliver and Buss were confident that the association would open new vistas and provide specialised plants and equipment or services for a variety of operations like polymers, oils and fats, plastics, fertilisers, pharmaceuticals, insecticides, aromatics, agro based products and food.

The initial areas of focus, however, will be the petroleum and petrochemical sector and environment and effluent-treatment sectors. While the Indian company is today well-versed in treating bio-degradable waste, it will be using Buss technology to treat non-biodegradable waste also, Mr. Rao said. The company expects to do an additional business of Rs. 10-15 crore through the tie-up with Buss.

Buss AG, a well-known Swiss firm, has made its presence felt internationally in most of the industries like plastics, chemicals and pharmaceuticals, food, energy and environment, oils and fats and petrochemicals, through its proprietary equipment and process technologies. The agreement between both the parties hopes to bring to Indian industry Buss specialised equippment and services covering industries of thin film evaporators, high viscosity thin film machines, samvac high vacuum distillers, convex dryers, paddle dryers, rovactors, sewage sludge dryers, air swept evaporators and ARD extractors. While the key critical components and engineering will be provided by Buss, complete plants will be offered by Hindustan Dorr-Oliver.

HIMACHAL PRADESH PLANS TO TAP MINERAL RESOURCES

The Himachal Pradesh Government has decided to draw up a comprehensive plan for exploitation of its vast untapped mineral resources during the Eighth Plan. An official spokesman said at Shimla, that it was proposed to spend Rs. 6 crores for this purpose during the Plan of which Rs. 50 lakhs would be spent during the current financial year. He said it was also proposed to set up a remote sensing unit in the geological wing of the industries department.

He said HP due to its rugged terrain and inaccessible remoteness had reamined poorly exploited. Only a few minerals like lime-stone-byrites, gypsum, rock-salt and silica-sand had been explored so far in the State. The spokesman said the Geological Survey of India has reported indications of several minerals like lime-stone of various grades, quartzite, glass-sand, gold, rock-salt, byrites, copper, cobalt, nickel, silver, antimony, gypsum, uranium, zinc lead, granites, slates, slabstones and kyanite in the State.

He said the geological wing of the State industries department was engaged in carrying out a detailed exploration of some of these minerals so as to ensure their economic viability and industrial potentials.

UP firm to make boilers with Australian collaboration

Uttam Maxitherm Boilers Ltd., promoted by the Uttam group of Ghaziabad, has planned to manufacture microprocessor/computer-controlled boilers for the first time in the country.

The company has obtained the technical know-how for this unit from Maxitherm Boilers Pty. Ltd., Australia, world leaders in the manufacture of multi-fuel, energy saving boilers. It had installed more than 3,000 boilers throughout the world. The company plans to manufacture 60 boilers per year. Since it is a running unit the additional cost for import of modern machinery and other balancing equipment required for manufacturing boilers would be around Rs. 6 crores to Rs. 7 crores.

The equity capital of the company will be around Rs. 4 crores; the promoters will bring in Rs. 2 crores and for the balance the company is expected to enter the capital market some time in August.

Mr. Raj K. Adlakha, Managing Director, said that with the coming up of this unit the waiting time for boilers which is at present around two years will be considerably reduced. He said it has been estimated that by 1996 the demand for boilers would be around Rs. 1,550 crores. As against this the present installed capacity for boilers is worth Rs. 1,360 crores with actual production in 1990 only for Rs. 891 crores. Thus there is huge demand supply gap in this industry.

Mr. Adlakha said the company has already booked production for the first year and further orders are being negotiated. It expects to achieve a turnover of Rs. six crores in 1993 which will rise to around Rs. 10 crores in the second year. With around 15 to 20 per cent profit the company will have no difficulty in serving the equity. Mr. Adlakha said there is large export potential for these boilers to the neighbouring countries.

VIDIANI ENGINEERS TO SET UP PLANT FOR EQUIPMENT FABRICATION

Vidiani Engineers Ltd. is an existing, well established company engaged in trading of engineering and steel items such as M.S. beams, pipes, channels, plates, etc. required by fabrication units. With a view to broadbase its operations the company is setting up a manufacturing unit to facilitate turnkey project implementation.

The company is setting up a manufacturing unit with sophisticated equipment for manufacturing critical equipments for process industries such as pharmaceuticals, chemicals and food processing. The company will also undertake fabrication work for the projects in medium & small scale sectors to be implemented by the company on turnkey basis alongwith technical consultancy services to the prospective entrepreneurs. Thus the company will fulfill its ideology of concept commissioning.

The company's plant is coming up at Village Dautana, tehsil Chhata, District Mathura (U.P.). It is a fast developing area situated on national highway No. 2 with organised railway network. It is also well connected with Delhi and Faridabad industrial areas and being situated in backward area, it is eligible for various government subsidies and benrfits.

The company has already acquired 6.5 acres of free hold land in this area and has completed the land and site development work. The erection of various machineries such as plate bending machine, shearing machine, transformer, etc. is expected to be completed by July 1992.

For its manufacturing process, the company shall be using design systems such as CAD/CAM systems, etc. which will improve company's operations in "inhouse" manufacturing activities as well as in turnkey projects. In case of turnkey projects the production process of each of the projects will be scientifically worked out in great detail by a project team which will be designated for that particular project. This will ensure a strict quality control and monitoring of the turnkey projects. Barring unforeseen circumstances, the company expects to commence trial run by August, 1992 and commercial production not later than September, 1992.

POLLUTION KITS: MYSORE KIRLOSKAR TIE-UP WITH US COMPANY

Mysore Kirloskar Ltd. has entered into an agreement with Synder General Corporation of the US for the formation of a joint venture company to manufacture pollution control equipment.

The new Bangalore-based company will be called Kirloskar Synder Ltd. and will commence operations on July 18, this year, according to the company's Managing Director Designate, **Mr. S. S. Bhandiwad.**

Synder General Corporation is a $1 billion American company, manufacturing an extensive range of heating, ventilation, air conditioning, air filtration, and air pollution control and systems. The company's well-known brands include McQuay, Wesper Commercial, Barry Blower, Jennfan and American Air Filters.

Mr. Vijay Kirloskar said that all sectors of the industry will be served with the high-quality Synder General products, which will be backed by applications know-how from Synder General companies acquired by industry leadership over the last 50 years.

LEATHER FOOTWEAR, SHOE UPPERS

Panel moots dereservation from small sector

Dereservation of leather footwear and shoe uppers from the small scale sector has been recommended by a committee set by the Commerce Ministry to make leather footwear the single most important item of export.

The committee has recommended that footwear components such as soles, and insoles and manufacturing aids such as lasts and cutting knives be included in the Annexe 3 inviting automatic approval for foreign investments. This would give the components to the cottage and small scale industry to manufacture good hand-made shoes. This would also give the mechanised shoe making industry components for mass production of shoes on assembly line basis.

It may be recalled that the extreme focus group on leather industry was set up by the Ministry of Commerce to identify constraints and to formulate a strategy to achieve significant increase in export of leather footwear which has been identified as an 'extreme focus' item for exports.

The committee wants the present custom tariff structure which encourages import of ready to use components be changed to encourage intermediate stage manufacturing within India rather than finished goods imports. It has, therefore, recommended that import duty on intermdiates and material for components be rationalised and reduced and brought under Custom Notification 224/85 to encourage domestic production.

The duty on capital goods, though concessional, remains one of the highest among our competing countries. Also, India has not made any efforts for relocation of footwear manufacturing facilities of western countries which our competing countries have done which has boosted their assured exports. The group has recommended that the capital goods' imports for footwear making whether new or second-hand be exempted from payment of customs duty and Custom notification 42/78 be amended.

It also wants that the plastic shoe lasts, aluminium forms, Teflon and wipers which are consumables be allowed to be imported as consumables under advance licence. Under Clause 79 (i) of ITC policy two per cent of spares each year on the CIF value of imported plant, one per cent each year of CIF value of indigenous plant is permitted.

The group wants the import of spares under this policy be raised to five per cent of CIF value of imported plant and three per cent of the purchase price of indigenous plants having imported components free of duty.

In order to build the footwear machinery manufacturing capacities within the country (which is non-existent today), the group has recommended import of parts of machines for their subsequent assembly within India and ultimate manufacturing. The group also recommends nil rate of duty for the imports of spares of footwear specific machinery.

Leather sector's exports performance has been quite impressive during the Seventh Plan. Exports increased from a level of Rs. 662 crores in 1985-86 to an all-time high of Rs. 3,210 crores during 1991-92.

The share of value added leather products in the total exports of leather has been steadily increasing and is now around 77 per cent (during 1991-92). Export of semi-finished leather has progressively declined over the years while that of value-added items have steadily increased.

Germany is the single largest buyer of leather products followed by the US, the erstwhile USSR, the UK, Italy, France, Japan and Australia.

During 1991-92, exports to Germany amounted to Rs. 700 crores, the US Rs. 445 crores, the USSR and the UK Rs. 360 crores each, Italy Rs. 300 crores and France Rs. 150 crores.

Footwear making in India has remained a cottage industry for a long time and even today out of the total estimated production of 350 million pairs of footwear, nearly 65 per cent is from the cottage and small scale sectors.

Only during the last decade there has been significant growth in modern footwear making sector. As a result, India's share in the global export of footwear is only a dismal 0.54 per cent.

There are several comparative advantages that Indian leather industry has vis-a-vis its competitors. This includes a big raw material base. India produces some of the finest calf, goat and sheep skins.

Besides, the industry has well developed tanning and finishing facilities capable of producing excellent quality leather suitable for different types of end uses and a comparatively low wage level of around 0.25 US cents to 0.49 cents per hour.

The main constraints faced by the footwear sector include reservation of footwear industry for small scale sector and the consequent retardation in the growth of modern production facilities necessary for meeting the quality requirements of the global market.

Absence of facilities within the country for manufacture of critical components and manufacturing aids required by shoe manufacturers has been cited as a major constraint, besides a lack of trained manpower and inadequate marketing strategies.

Mitsui moots proposal for IISCO modernisation

The Japanese are back again with a new proposal for participating in the modernisation of the Indian Iron and Steel Company (IISCO) says a report *The Financial Express.*

According to highly-placed sources, the latest one has come from Mitsui and Company Ltd., a global entity dealing in the trade and technology fields. A team of Mitsui executives, it is learnt, met, **Mr. Santosh Mohan Dev,** Union Steel Minister, and the Management of Steel Authority of India (SAIL), late April in Delhi with the proposal for turnkey modernisation. "They came and met Mr. Dev and some of us. It was an exploratory meeting where no commitment was sought or given", the sources said.

About five years ago, the first IISCO modernisation proposal had envisaged Japanese participation through a consortium of five companies led by Nippon Steel Corporation. Estimated at Rs. 300 crores, it had found strong favour with the Rajiv Gandhi Government. However, political changes in New Delhi resulted in putting IISCO out of picture.

The details of the meeting between the Government and the Japanese are not available in full as yet. But it is understood that the Government is interested in first formulating an ideal route for the modernisation. The Japanese proposal for the matter, also the ones put forth by the three private sector steel companies in India, will receive attention as and when a final decision is obtained in regard with modernisation through the private sector units.

Entrusted by the Government with selecting an efficient, cashflush and ideal private sector partner, SBICAPs has already shortlisted the Mittal's Ispat group, Mr. Viren Shah's Mukand Ltd., and the Gupta's Lloyd Steel Industries Ltd. In terms of importance, Mukand and the Ispat group are evenly poised. Lloyd Steel, it is learnt, is already out of the reckoning. Both the Mukand and Ispat managements, in their initial proposals, have spoken about phasewise modernisation, after obtaining SAIL's share in it at par and raising funds from the market.

There is an unsubstantiated theory that the Government is likely to take Mr. Shah's proposal seriously in view of his sound business as well as political credentials. The Mittals are, however, lobbying hard for it. By available ind cations, two sets of opinions are emerg ing in the Ministry as well as in SAI While one set favours private sector pa ticipation the other insists on having done through SAIL.

At the ground level, the IISCO Mar agement, led by **Mr. S.K. Das Patnail** is busy using various channels to pus for modernisation by SAIL itself. It ha been argued with the Ministry that th Burnpur Work's small profit this yea is proof enough that IISCO, as a whol can be put back on the road to growt with assistance from the private secto

Mr. Patnaik's press conference i February announcing IISCO's financia results, much before, his Chairman, **Mr S.R. Jain,** could do so about SAIL' was seen to be a neat tactic to projec IISCO as a company capable of turn ing around on its own.

The core segment of the Ministry, i is believed, favours the private secto route because it is convinced that SAII does not have the resources at its dis posal to undertake such a daunting job Mr. Dev is not exactly averse to the pri vate sector route. As things stand, SAIL at the behest of the Ministry, will shortly set up a committee to go through the SBICAP's status report on the three shortlisted bidders.

NMDC plans Rs. 1,000 crores investment in the Eighth Plan

The National Mineral Development Corporation (NMDC) has drawn up a Rs. 1000-crore modernisation, expansion and diversification plan during the Eighth Plan. The company plans to raise Rs. 400 crores through internal accruals and the balance by way of term loans and public issue.

NMDC Ltd., which has posted excellent results for the year ended March '92, will soon join the list of Public Sector Units (PSUs) for disinvestment. It earned a profit of over Rs. 125 crores, surpassing all past records in production and despatches of iron ore.

The company was in the red till three years ago when it wiped out its accumulated losses in 1988-89 and paid a maiden dividend of Rs. 40 per share aggregating around Rs. 517 lakhs in 1990-91. The present equity held entirely by the Union Government stands at Rs. 132 crores.

Reviewing the progress made by the company in Hyderabad on May 2, **Mr. P.C. Gupta,** Chairman-cum-Managing Director, said the turnaround was due to diversification achieved through R&D and alternate markets. Devaluation of rupee has also helped realise higher amounts for its exports of ore and the foreign exchange earned during 1991-92 was Rs. 444 crores.

On the iron ore export Mr. Gupta said it may taper off towards end of 2000. The contract with the Japanese will be honoured but they may be persuaded to modify the terms. While export from Bailadilla may go down gradually, there is a lot more ore available from Bellary-Hospet belt, Goa and Orissa-Bihar region, he added.

On the private sector participation in mining activities, he said efforts are on to form a joint venture with major consumers as a decision has been taken to open up two new mines. Funds will be mobilised by floating a new company with wide public participation, Mr. Gupta said. NMDC has already committed itself to supply of high quality Bailadilla ore to atleast 10 sponge iron units of which five have so far come into being. Domestic supplies of ore account for 30 per cent of the total production. This includes supplies to Vizag Steel Plant.

Apart from increasing iron ore production from the present 12 million tonnes per annum to 22 mt. and the diamond production from 18000 carats to 90000 carats, plans have been drawn up to enter the production of iron powder, ferrite oxide, deadburnt magnesite, SMS grade limestone, ilmenite (in Vizag, a Rs. 200-crore project), tin, tungsten (in East Godavari), pig iron and iron ore pellets.

SAIL TO INVEST RS. 590 CR. ON POLLUTION CONTROL

The Steel Authority of India Limited (SAIL), realising the imperative to control pollution and identifying it as one of the thrust areas, has planned to invest Rs. 590 crores on pollution control measures during the various modernisation programmes now being implemented in its plants.

Besides this, under the additions, modifications, replacement (AMR) programme, 54 schemes were under implementation at the major plants at a cost of Rs. 137 crores, a SAIL spokesman said at Bhubaneswar.

SAIL had already invested $2.8 million under the World Bank scheme to set up the state-of-the-art monitoring and testing facilities at its plants and mines as well as at the Research and Development Centre for Iron and Steel (RDCIS) at Ranchi and the Environment Management Division (EMD) at Calcutta. While routine monitoring was carried out by the plants and mines, specialised ultra accurate monitoring to assess suitability of new technologies was the responsibility of RDCIS.

The spokesman said SAIL plans to achieve the objective of improving the environment surrounding its plants by streamlining the working of the existing pollution control facilities in the plants to bring them to levels of optimum efficiency, having additional facilities to meet the norms and incorporating adequate pollution control arrangements in the modernisation programme.

To achieve this goal, SAIL has adopted a two tier organisation structure by setting up a central environment management division (EMD) at the corporate level and environment control departments at the plant level. SAIL undertook a comprehensive study under a World Bank scheme covering four major plants at Bhilai, Durgapur, Rourkela and Bokaro and the associated mines, he said. The study covering a period of two years was conducted by an Australian firm. The study, was one of the most extensive of its kind taken up in any Indian industry.

The main objectives of the study were developing and setting up state-of-the-art environment monitoring facilities at plants, mines, RDCIs, and EMD, assessing levels of water, air and noise pollution and waste generation at plants and mines. Identifying pollution-prone areas and evolving comprehensive environment management plans, assisting SAIL in developing a data bank and library on environmental matters, and training its personnel to develop expertise in various areas of environment management are the other major needs, bought out by the study. According to the SAIL spokesman, the Australian Government would provide a grant aid of $6 million to enable the training of 200 SAIL engineers in mining operations and environment management practices.

CAG indicts scientific bodies for misuse of funds

The Comptroller and Auditor General (CAG) has severely indicted government scientific departments for their failure to implement several projects and for mismanagement of funds. In a report presented in the Parliament on May 6, the CAG said the Department of Nonconventional Energy Sources (DNES) has not shown any results in several major projects.

The DNES paid Rs. 4.34 lakh to a public sector undertaking (PSU) to set up three solar dryers at Rae Bareilly, Sultanpur and Sonepat. Not only did the PSU fail to set up the dryers, but it also did not refund Rs. 3.42 lakh to the DNES. Similarly, the DNES paid Rs. 134 lakh to the Indian Institute of Technology (IIT) to set up a pilot plant to produce ethyl alcohol from agricultural residues and study the commercial viability of substituting diesel with this alochol. The money has been spent, the pilot plant imported, but the commercial feasibility has not been demonstrated so far, the report says.

DNES paid Rs. 10 lakh to the IIT and Geological Survey of India (GSI) to construct a cold storage plant. The plant, set up without proper soil studies, only got severely damaged. The Zoological Survey of India (ZSI) surveyed one-third of the country's area in the last two decades, but 35 per cent of the specimens collected by it remain unstudied due to lack of manpower.

The Department of Biotechnology (DBT) has overfunded a project on embryo transfer technology by about Rs. 4 crore. Over Rs. 25 lakh have been spent for seven years on a DBT project on developing a biocide to control mosquitoes carrying malaria parasites but the pests could not be controlled dur trials in Delhi. The Department sp over Rs. 12 lakh on a trial to inj growth hormone into the eggs of e nomically important fish, only to w on fish that were ultimately identif as "economically unimportant".

A metallic glass unit set up by Department of Science and Technolo (DST) for production of metallic glas was closed down four years later af spending Rs. 35 lakh, because of la of space and scientists. A DST proj on a garbage-processing plant and co struction of 1,800 toilets, handed to computer company, is gathering du

Only two blocks of 30 toilets ea have been constructed, and no garbag processing plant has been installe leading to the company holdi interest-free funds to the tune of R 1.92 crore. The Department of Atom Energy (DAE) has not used import turbine blades costing over Rs. 37 lak lead bricks worth Rs. 6.77 lakh and le ingots valued at Rs. 1.21 lakh.

The Department of Electronics h not recovered several of the 21 loa given by it to various bodies, and a pri cipal, amounting to Rs. 13 crore a interest of Rs. 10 crore are overdu some of them as far back as fro 1980-81. It has also failed to deliver the navy, ship-based sonar simulato after spending Rs. 1.17 crore and years in developing them.

The Department of Ocean Develo ment (DOD) has not realised most of targets in the Seventh Plan due to la of effective monitoring. A sophisticat hydrosweep system imported at a co Rs. 7 crore remains unutilised, whi dredging and sampling of nodules cou not proceed as per the plan in spite spending Rs. 2.44 crore. No plan has far been formulated by the DOD f management of waste materials whi constitute 97 per cent of the total ma of the nodules and also contain tox substances.

The Department of Space has over estimated the amount of perchlorate needed for its programmes, leaving behind a balance of 568 tonnes which would last another five years, the CAG report said.

The Indian Council of Agricultural Research (ICAR) has unused equipment costing Rs. two crore in its stores and laboratories. One of its constituent institutes, the National Bureau of Fish Genetic Resources, set up in 1983, found a suitable site for its fish farm only last year.

Without a fish farm project being completed, it has spent Rs. 1.67 crore during these eight years. The Indian Council of Medical Research spend Rs. 2.80 crore on a malaria control programme without coordinating its field activities with the Central or State authorities, leading to overlapping of activities. ICMR's studies on leukemia were terminated, without any result, after spending Rs. 29 lakh, while no report is available on the management of rheumatism, on which Rs. 76 have been incurred.

Equipment costing Rs. 1.16 crore, including imported ones, were not commissioned or used as they were defective or damaged, the report said. Unused equipment has also been the feature of the Council of Scientific and Industrial Research (CSIR) laboratories. In the National Metallurgical Laboratory (NML), Jamshedpur, equipment costing Rs. 18 lakh has not been used for about nine years and other equipment costing Rs. 12 lakh was laying packed without being installed for more than 54 months.

CSIR's National Chemical Laboratory (NCL) at Pune could commercialise only one of its processes during the last six years, out of the total of 61 NCL processes commercialised since 1950.

Fifty NCL processes released to industry till 1973 have still not gone into production, while 55 processes could not be released for commercial exploitation.

After spending Rs. 36 lakh, a catalyst developed at NCL is still to be tested before transferring the technology. A project on solar grade polysilicon, which was to be completed in one year, could not achieve its objectives even after six years and an expenditure of Rs. 62 lakh incurred.

SUGGESTION ON EXIM POLICY INVITED

The Commerce Ministry has invited suggestions from the trade and industry for further liberalisation of the export and import policy and simplification of the procedures. The suggestions can be sent to the Chief Controller of Imports and Exports.

An official note issued in New Delhi on May 8, said the policy and standard input-output and value addition norms for the duty exemption scheme were announced on March 31 and the new Handbook of Procedures to implement the policy on May 1.

A second edition of the Exim policy and the Handbook is being brought out on September 1 and it is in this context that the suggestions have been invited. The policy as well as the procedures are valid till March 31, 1997.

The note says the Handbook has been designed to lay down simple and transparent procedures which are easy of both compliance and administration and the Government hopes that the objectives have been achieved to a significant extent in the new policy and procedures.

However, it is the intention of the Government to further liberalise the policy and simplify the procedures on a continuing basis, the note adds.

Copper imports : Rs. 500 cr. outgo likely

The Ministry of Mines estimates a foreign exchange outgo of Rs. 500 crores towards import of copper in the fiscal 1992-93 at the current prices prevailing in the international market.

With the production of copper by the Hindustan Copper Ltd., (HCL), the sole producer of primary copper in the country, having reached a plateau, the import of this critical industrial input will continue to grow. However, in the current year, the import may not be much as HCL is having substantial carryover stocks to feed the consumer industry. The demand for import, however, will go up in the long run. As per official estimates, by the turn of the century the foreign exchange requirement to meet the demand-supply gap at current metal prices and exchange rate would touch the figure of Rs. 1,500 crores per annum unless indigenous production capacity was increased.

As far as indigenous production capacity is concerned, HCL is operating at its optimum capacity and produces nearly 50,000 tonnes of copper metal annually against a demand of 1.8 lakh tonnes per annum. The nation has to depend upon imported copper to the extent of 60,000 to 70,000 tonnes per annum. The rest of the demand is met by production from the secondary sector. Against an annual import of about 60,000 to 70,000 tonnes, the inflow of copper in 1991-92 remains restricted on account of foreign exchange crisis. It may be mentioned that for regulated imports of coper, the Minerals and Metals Trading Corporation (MMTC) acted as canalising agency. At the beginning of each year, the Inter-Ministerial Committee used to assess the demand-supply gap and subsequently the foreign exchange was released to the canalising agency for buying fixed quantities from the international market.

However, in 1991-92 due to tight balance of payment position, the MMTC was not released foreign exchange for import of canalised items like coper and nickel. Instead, the Government liberalised the Trade Policy allowing direct import of refined copper against Exim Scrips. The Corporation on its part planned import of these metals under its Exim Scrips/Additional Licences to feed the consumer industry. The import remained restricted on account of retarded industrial activity during the year. Even the sales of copper by the HCL went down by 19 per cent in 1991-92 to 52,266 tonnes from 64,558 tonnes in the preceding year. This year, however, the consumption is likely to go up but the import may remain restricted on account of high opening stocks of HCL and secondly because consumers would have to buy foreign exchange from market rates for import which would make it dearer.

New industrial policy announced in AP

Reduced sales tax on select items like electronics goods, cement produced by mini-cement plants, wheat and wheat products, and a uniform tax of four per cent on goods manufactured and consumed within the State by manufacturing units are among the highlights of the new industrial policy of the Andhra Pradesh Government announced by the Chief Minister, **Mr. N. Janardhan Reddy.**

The latest policy document released to newsmen contained a number of measures already under implementation during the current year. The policy emphasised the fact that power subsidy for newly-started industrial units at 25 per cent for three years is unique and not matched by any other State in the country.

Moreover, while other States offered deferment of sales tax for varying periods, AP incentive scheme allowed tax deferral for 10 years. To satisfy a long-pending demand from industry in the State, the Government decided to vest the AP Industrial Infrastructural Corporation (APIIC) with powers of a local authority. This would result in avoidance of payment of dual levies or taxes on industries located in industrial estates and also facilitate better maintenance of these estates, the policy note stated.

Mr. Reddy announced that specialised industrial complexes are coming up for chemical units at Ongole, leather complex at Tada, artisan and powerloom complexes at Rampur, Kalahasthi and Kakinada. Referring to the four growth centres sanctioned sometime ago, the policy statement said that work had already commenced at these centres: Bobbili, Vemsur, Hindupur and Ongole.

The Government would also take steps to encourage private entrepreneurs to invest in the construction and maintenance of roads and bridges and would also ensure a reasonable return on such investments by suitable systems, the note stated. On the power scenario, it was stated that during the next five years, 2000 mw of additional generation would be installed. Vizag super thermal of 1000 mw is already on anvil and the Government is also keen on private and NRI investment in this vital sector.

For the SSI sector, several procedural requirements have been simplified. Marketing support is being extended to cover 87 more items for purchase by the Government and Government units. Under the tiny sector, 23 product lines are being added to existing 75 products, which exempted these units from all types of clearances. On rehabilitation of sick units in the State, the policy note stated that 32 units were placed on a programme of the Bureau of Industrial and Financial Reconstruction (BIFR) and cases relating to 43 units are still under examination. For some of the State public sector units that have become totally unviable, all steps would be taken to encourage private sector to participate directly in the management and control of such units. High priority would be given where such transfers could be possible through workers' co-operatives. The government has accorded industry status to sericulture as well as powerlooms.

This would make them eligible for all incentives being offered to new industrial units in the State. For helping increased flow of NRI investments, a high power committee under the chairmanship of the Chief Minister has already been constituted to ensure speedy clearances of all NRI proposals and projects. Since January last 26 project proposals involving an investment of Rs. 763.58 crores have been received and are under consideration by the Government. Apart from the software technology park in the Hyderabad, a hardware technology park is also under

active consideration in collaboration with leading Japanese companies. Outlining the latest industrial promotion scenario, the Chief Minister stated that an investment of Rs. 3,377 crores is involved already in new industrial units now under various stages of implementation in the State.

TN association welcomes measures

The Chemical Industries Association (CIA) has welcomed the new industrial policy announced by **Shri N. Janardhan Reddy,** Chief Minister of Andhra Pradesh on May 7, 1992 at Hyderabad.

The State Policy has taken note of the new industrial policy being adopted by Government of India and also the subsequent developments, says a press release issued by the Association in Madras on May 8.

Vesting the state's infrastructural corporation with powers of local authority to avoid dual or multiple levies and loss of time on the part of entrepreneurs and, in addition, need for better maintenance of industrial estates is a point to be specially noted, in the new policy, says the Association. The Association has also welcomed the move to set up industrial complexes such as chemical industry complex at Ongole, a leather industrial complex at Tada situated near Madras which is already congested, an electronic complex at cherapalli etc. The policy interalia mentions the nature of work already commenced at the four growth centres viz. Bobbili, Vemsaur, Hindupur and Ongole.

The area of power has also received sufficient attention in the Industrial Policy. The announcement that during the next five years 2000 mw of additional generation would be added has been welcomed by the Association. "Our Association feels that with the wealth of natural gas resources unparalleled in any other states in southern region, the state government should in the background of totality of growth needed in all sectors, also encourage setting up such petrochemical industries like methanol and ammonia which would itself be sources of generation and supply of power to the grid as modern processes are based on self-power generation even in excess of what is needed for their own working," says **Mr. S. Krishnaswamy,** President of the Association. "Ofcourse the Association hopes that sufficient attention will be paid to transmission and distribution and to improve the quality of power," he adds.

The power subsidy for newly started industrial units at 25 per cent for three years and sales tax deferrment for ten years in general with reduced rates on selected items like electronic goods, cement produced by mini-cement plants, wheat and wheat products as demanded by a section of the agriculture industry, and above all a uniform tax of 4 per cent equal to central levy on goods manufactured and consumed within the State by manufacturing units are certainly the highlights of the new industrial policy. These, the Association is sure, will be welcomed by industries of all classes of investment. With the various measures announced for investment promotion and with the speedy and imaginative implementation of these measures Mr. Krishnaswamy, is confident that it should be possible for Andhra Pradesh to attract new investments both from within the state and from outside the state including NRIs.

MOIL SIGNS MoU

The Manganese Ore (India) Ltd (MOIL), a public enterprise under the Ministry of Steel has signed a memorandum of understanding (MoU) with the Government for the year 1992-93. The MoU was signed in New Delhi recently by the Chairman-cum-Managing Director of MOIL, **Dr.M.P. Dewangan,** on behalf of MOIL, and the Secretary, Steel, **Mr.R. Vasudevan** for the government, according to an official release.

10,000 tonnes uranium oxide ores identified

The Atomic Minerals Division of the Department of Atomic Energy has augmented the proven uranium oxide resources by more than 10,000 tonnes. The division has also identified new surface uraniferous zones and areas of xenotime bearing riverine placers in Madhya Pradesh, Gujarat and Karnataka.

It has also discovered an estimated quantity of 8.94 million tonnes of ilmenite in placer sands and recovered about 3,200 kg of columbite-tantalite and more than 13,600 kg of heavy mineral concentrates, according to the annual report of the Department for 1991-92. Exploratory mining for evaluation of uranium deposit at Tummalapalle in Andhra Pradesh commenced during the year alongwith the preparatory work for taking up mining at Otha in Himachal Pradesh.

New uraniferous zones were discovered and extensions of known occurences traced in 15 places in the country through ground radiometric and geological investigations. Geochemical surveys held in more than 10,000 sq km indicated anomalous uranium zones in parts of Karnataka and Andhra Pradesh, the report said.

The division also assessed ilmenite and monazite reserves of 8.94 and 0.06 million tonnes respectively in three areas in Andhra Pradesh, Tamil Nadu and Kerala. The offshore investigations in collaboration with the Geological Survey of India also continued during the year.

Although trial runs had started at the new thorium factory at the Orissa Sands Complex (OSCOM), Indian Rare Earths (IRE) Ltd. encountered severe cash crunch at OSCOM. This was mainly due to the slump in the international market and build up of inventory of finished goods, the report said. The production at the minerals separation plant at this complex was suspended from October last. The acid regeneration plant had also suspended its operation from March 1991. The pollution clearance from the Tamil Nadu Government and forest clearance from the Centre were expected shortly for the new IRE project at Kudiraimozhi in Tamil Nadu.

IRE would take up its Ayiramtengu project in Kerala during the Eighth Plan period. The heavy mineral reserve there can sustain operation of the mineral separation plant for about 30 years. A new project for the separation of rare earths was on the anvil at Alwaye, the report said. A prefeasibility study had been completed to augment monazite processing capacity there. Additional facilities would be set up at Chavara in Kerala for improving the quality of ilmenite.

Efforts were also on to set up a zirconium oxide plant of increased capacity at Manavalakurichi in Tamil Nadu. Programmes for the production of value added products were on the anvil especially on pigment and titanium metals. Efforts were on to set up joint ventures with Tamil Nadu Industrial Development Corporation, Andhra Pradesh Minerals Development Corporation and the Travancore Titanium Products Ltd. in pigment and titanium metal production, the report said.

HINDUSTAN ZINC BEGINS EXPORTS

Hindustan Zinc Ltd will be producing about 27,000 tonnes of surplus zinc in 1992-93 after taking its share of the domestic market. According to an official release, this information was given by the Minister of State for Mines **Mr. Balram Singh Yadav** in a written reply to the Lok Sabha on May 4.

The company has received orders for export of 730 tonnes of zinc to United Arab Emirates and Pakistan. Export to United Arab Emirates of 160 tonnes earned foreign exchange worth $7.50 lakh. The exports will be completed by mid-1992. After the commencement of Chanderya lead zinc smelter, the company would be able to produce surplus zinc for export apart from meeting the entire domestic requirement.

RIICO TIES UP 134 PROJECTS IN 1991-92

The Rajasthan State Industrial Development and Investment Corporation (RIICO) attained an all time high performance during 1991-92, including sanctioning of term loans, improving the viability of land for its potential industrial areas and equity.

A spokesman of RIICO said in Jaipur recently that the corporation sanctioned term loans to the tune of Rs. 50.25 crores in the past one year against Rs. 36.08 crores in the previous year, exceeding target by 67 per cent.

In terms of disbursement of term loan, RIICO attained the highest place among all similar corporations in the country by disbursing Rs. 25.43 crores. The spokesman said in all 134 new projects were tied up in the past one and half years, which would catalyse a new investment of Rs. 1,850 crores in the state.

The notable projects included manufacture of colour TV picture tubes, soft contact lenses, polypropylene yarn, cement, security ink and washing machines.

He said it was after a long time the infrastructure development works had been provided a genuine thrust in the state by spending Rs. 33.52 crores on improvement of quality of services in different industrial areas during the last one year.

As many as 2,137 acres of additional land had been acquired by RIICO to expand its industrial areas by spending a sum of Rs. 22.59 crores.

Highlights in Chemical Technology

COMPOSITE AND HYBRID COMPOSITE BOARDS DEVELOPED

The following types of composite boards have been developed by RRL, Jammu, from *Lantana Camara*, available throughout the country as weed & *Leucaena leucocephla*, a fast growing tree introduced by RRL.

Hybrid composite boards

A hybrid board containing resin impregnated particles sandwiched between fibre boards has been developed which is comparable to solid plywood surfaced block board & veneered particle board. Besides *Lantana* and *Leucaena*, the hybrid composites could also be made from 100% agro industrial residues. The costly binder in hybrid board is reduced by 50% compared to particle boards or laminated boards for a board thickness of 1.2 cm. Hybrid composites have superior mechanical strength and surface properties.

Jute fibre laminated boards

Composite boards from above plants with surfacing by resinate jute fibre have been developed. Its properties are comparable to plastic laminated particle board or wood panels. Strengthwise it is superior to ordinary particle board. Its cost is one-third the cost of plastic lamination ordinarily given to other kinds of wood panels. With jute fibre lamination the mechanical strength, surface props and dimentional stability of board are improved. (*RRL, Jammu Newsletter*, 18 (2), June 1991.)

SHEER CHANCE

It generally takes years of hard work to achieve significant technological and scientific breakthroughs but occassionally, sheer accidents too blend a hand. The discovery of penicillin is one such example. And now another accident is changing the face of semiconductor research. A graduate student Bernic Meyerson, doing research on the surface chemistry of silicon, dropped a silicon wafer he had just finished washing in an acid bath. In a hurry, he did just what any other student would have done; he rinsed it under a tap hoping to make amends. The wafer surprised him by coming out of the water nearly dry. Like everyone else, he believed that a layer of silicon oxide formed on wafers whenever they were exposed to water, and that the oxide should have kept the wafer damp. He soon discovered otherwise — it was not silicon oxide on the wafer but silicon hydride. The difference was significant; it meant that it was possible to create silicon compounds, thought to be impossible till then. Later, having been hired by IBM, Meyerson was able to develop circuits, which broke several speed records, with the new compound. Now the Japanese have come up with the same compound —again as the result of an accident caused by another researcher. (*The Economic Times*, 7th, Dec., 1991).

NEW COATING FOR INCREASING EFFICIENCY OF LAMPS

A lamp coated to let through visible light while blocking IR light and reflecting it back onto the filament has been developed by researchers at General Electric. A sharply lower amount of electrical current is thus needed to keep the filament hot enough to produce the light, providing an energy cost savings up to 60% over conventional incadescent lamps. The first commercial application for the technology is in a new family of incadescent halogen lamps. A halogen lamp consists of 2 bulbs, a small one of quartz nested inside one of glass. The quartz bulb contains a filament and an inert halogen gas which counteracts evaporation of the filament at high temperatures. The IR coating is placed on the outer surface of the quartz bulb, which is precisely shaped to focus the reflected IR light onto the filament.

In coating its lamps, GE makes use of chemical vapour deposition to deposit alternating layers of high & low refractive material. Major advances in coating chemistry were required to provide a coating that would resist temperatures of upto 800°C. Production techniques then had to be devised for the deposition of three to four dozen uniform layers of coating each about 1000A° thick. (*Chem. Engg. News*, 68 (49): 35 (1990).)

BETTER BLENDING

When two fibers are blended in one yarn, they provide the qualities of both, for example a cotton and synthetic fiber blend will have the absorbency of cotton and the strength of synthetic fibers. Despite its popularity the quality of belnded yarns has not reached the desired level because of the technology used. Conventional techniques of blending cotton and synthetic fibers involve randomly wound fibers on a bobbin called roving.

When put on a spinning machine, the bobbin spins the fibers into yarn. Unfortunately, the weaker cotton fibers wear off sooner than the synthetic ones, resulting in the formation of unsightly small balls of the loose threads called pills.

A.P.S Sawhney and his co-workers at the Southern Regional Centre, U.S.A. have recently developed a new spinning technique to do away with this problem. The technology involves three rovings — two cotton and one polyester, spaced 6-13 mm apart and drawn through a series of rollers. When the fibers meet after emerging from the rollers, the synthetic fiber is sandwitched between two cotton fiber strands creating a unique interlocking of fibers that prevents stripping of the cotton sheath and thus pilling. This technique paves the way for improved fabrics for the future. (*PID Science Features, Financial Express*, 13th Oct., 1991).

PORTABLE HOUSES FROM BALMER LAWRIE

Balmer Lawrie & Co. Ltd., have made ISI certified portable Bunk Houses. These are soft, long metal containers, insulated with about 10 cm crown of fiberglass. The fiberglass crown insulation helps provide comfortable living and working conditions in any environment. These are available in different modules and cater to various functions that range from living rooms, bath and toilet, dining hall, site office, to a laboratory. Balmer Lawrie have so far supplied approximately 1200 of such Bunk Houses to ONGC, Oil India etc. for their working sites.

Also, fiberglass reinforced plastics (FRP) have been selected for constructing pre-fabricated housing shelters which would be used by the armed forces in the glacier regions. These shelters built on the same lines as freight containers have aluminium structures with inner and outer skins made of FRP. Top and sides of these housing shelters are insulated with a phenolic foam and the bottom by a crown of Fiberglass for fire safety.

FRP is ideal in such sub-zero temperature conditions. Not only does it have the advantages of light weight, high strength and excellent weather resistance, but also it does not suffer from embrittlement which is a major problem with many other conventional materials. (*PID Science Features, Financial Express*, 13th Oct. '91).

SOFTENING RUBBER

Two Japanese companies, Tokyo Electric Power Co. Ltd., and New Japan Radio Co. Ltd. have jointly developed a device to heat and soften natural rubber using microwave technology.

The device is reported capable of substantially reducing heating by vapour, and uses no heavy oil during the heating process, thus preventing pollution. One of the branch offices of Tokyo Electric received an inquiry about a device to soften raw rubber and in turn asked Japan Radio, which manufactures microwave generators and heat sources for electronic ranges, resulting in a collaboration between the two.

In this new process, raw rubber is fed into the device by way of conveyor belt and a microwave is directed onto it. Silontech Co. Ltd. an adhesive tape maker, introduced this device into its factory with the result that, the process of softening raw rubber which used to take 3 to 4 days using a conventional counterpart, took only 14 minutes. Also the device requires power consumption on only 10 kw with energy cost reduced to one-nine-tenth of the normal. (*Financial Express*, 13th Oct. '91).

SMOG AS SHIELD

Surprising as it may seem, going by the findings of a recent study conducted by scientists at the University of Chicago, air pollution could actually retard the amount of damaging ultra violet rays reaching the ground. Even as the now-famous ozone hole over the Antarctica keeps getting bigger by the day, new data collected by the team at Chicago reveal that in some countries with bad air pollution, such as Japan, the amount of ultra violet rays reaching the ground has actually begun to come down.

In the US, pollution has reduced the expected increase in damaging rays by 50% on average, and even greater amounts in smoggy areas. The reason for this, the scientists claim, is that increases in ozone-containing smog near the earth are counter-balancing decreases in the ozone layer above the earth. That does not mean that air pollution is good though, since ozone near the ground could create even greater problems than it solves. When all is said and done, the downside of pollution still remains for more than the upside. (*The Economic Times*, 16th Nov., '91).

ANOTHER FEATHER IN ICRISAT's CAP

For the International Crop Research Institute, for the Semi-Arid Tropics, ICRISAT, it is time to reap a bumper harvest. Recently, the organization won kudos by announcing new varieties of pigeonpea and rice. Now, it is once again taking bows, this time from a grateful Namibian Government. For, thanks to the assistance provided by the Hyderabad-based ICRISAT, Namibian farmers have been able to double the output of a staple cereal, pearl millet, Okashana 1 — or ICTP 8203 in ICRISAT parlance — which has now taken over more than half of Namibia's total pearl millet acreage with fruitful results. This year, farmers using traditional methods reaped over 600 kg. per hectare with the new variety, as against yields of 300 kg. earlier. Scientists, reckon that with improved cultivation techniques, yield could even go up to 2.4 tonnes per heactare — which would increase Namibia's total yield of millet by eight fold. What's more, ICRISAT has now come out with an improved version of the open pollinated ICTP 8203, called the ICMV 88908. With a long term project — involving other crops — as well as a bilateral agreement on the anvil, the field is set for mutual gains. (*The Economic Times*, 21st Sept., '91).

CORN-STEEP LIQUOR

A new economical method of isolating inositol, a vital ingredient of multivitamin preparations, from corn-steep liquid has been recently reportedly from the Regional Research Laboratory (RRL), Jammu. Inositol is a high-value vitamin that is imported at present. Researchers at RRL have found that both corn-steep liquor and ricebran are rich sources of not only inositol, but also phytic acid and phytin which are of value in medical, dental and food industries. However, isolation of these products is easier from corn-steep liquor.

During isolation, the researchers just removed proteins from the aqueous extract of corn-steep liquor and precipitated phytin in the form of calcium phytate by adding lime. (*Financial Express*, 19th April, 1992)

NEW WHEAT STRAIN WITH GOOD YIELD

A Mexican dwarf wheat variety, genetically altered to suit Indian conditions by scientists at New Delhi, has produced excellent yields in Punjab and neighbouring areas and is likely to replace the existing low-yielding varieties.

Scientists at the Indian Agricultural Research Institute (IARI) have also recently developed a high-yielding variety of chickpea (chana) and two hybrids of tomato suitable for growing in various parts of the country. A wheat strain, Tenari 71, brought from CIMMYT (the International Maize and Wheat Improvement Centre, Mexico), was introduced in parts of northern India in 1985 to suit the limited irrigation areas. The variety was crossbred with an Indian wheat strain NP 890 and supplied to farmers two years ago. Kundan, the crossbred strain, has become very popular and the yield results are excellent, Dr. R.N. Sawhney, a senior scientist at IARI, told correspondents at New Delhi on April 20.

It is an improved variety compared to another IARI strain, HD 2329, cultivated in over 70 per cent of Punjab since early 1970s. Dr. Sawhney said a single wheat variety grown over such a large area becomes vulnerable to attacks by pests and a replacement was long overdue. Kundan will be the ideal replacement. For, results from farmers' fields indicate that it has shown good yield in both water-deficient areas and in highly irrigated regions with minimum fertiliser and other inputs.

Scientists attribute its success to the hybrid strain acquiring the high-yield and dwarf characteristics of Tenari 71 and grain traits of the Indian variety. Besides, its nitrogen-fixing efficiency is better, thus boosting the yield. Under rain-fed conditions, the average yield is 2.75 tonne per hectare (ha), nearly one-fourth of a tonne more than HD-2329 and C-306, currently planted in northern India.

With moderate inputs, Kundan's yield more than doubles to 5.8 tonnes per ha. The other two varieties do not show such appreciable jumps in yields under same conditions. However, with heavy inputs, both Kundan and HD-2329 yield the same (6.2 tonne per ha).

As Kundan combines productivity with efficiency (minimum input and maximum yield), thereby reducing the production cost, it appears to be a boon for small and marginal farmers who do not have access to the required inputs, IARI's Director, Mr. S.K. Sinha, said.

Kundan has also proved to be very good for making baked and Indian bread, compared to indigenous wheat varieties. Dr. Sawhney said its bold, lustrous and hard grain sells at a premium ranging between Rs. 75 and Rs. 100 for evey 100 kilo.

It is also suitable for extended dates of planting from normal to late sown conditions which permits cultivation of Kundan in wheat-rice, wheat-potato, wheat-cotton rotations, some of the cropping systems practices predominantly in the Indo-Gangetic plains.

Two other genetically-improved varieties, DL 802-3 and DL 803-2 from IARI laboratory are in the pipeline. DL 802-3 appears to be wheat with great degree of flexibility in planting time and grows to an optimum height with stiff straw combined with good grain. The yield is good even if planted late. DL 803-2 may excel in performance in normal planting. Both these wheat varieties carry genes of rye, a close relative of wheat and this gives them a higher yield potential. They are resistant to three types of crop-harming insects — yellow, brown and black rusts — and karnal bunt, limited infection of which gives a grain a foul smell. Chickpea or Bengalgram is one of the 12 major pulse crops grown in India and its productivity has remained stagnant in the last four decades. A few varieties of chickpea, developed at IARI in the last 20 years, are grown widely in India. Using genetic engineering techniques, IARI scientists have now developed a variety which gives 15 to 20 per cent increase in yield. It will be released to farmers soon. Two hybrid tomato varieties, one of which is suitable to the hot north Indian summer, and the other which grows round-the-year, have also been developed. (*Times of India*, 21st April '92).

BLAZING SWITCHES

Even as India slowly begins to move into the era of electronic switching, a team of researchers in Glasgow University's Electronics and Electrical Engineering Department in Scotland claim to have produced the World's fastest switch — a device operated by laser that could pave the way to handling 2000 simultaneous TV channels or 1.2 million telephone conversations.

Officially christened as a non-linear directional coupler, the switch uses intense pulses of laser light lasting 10 pico seconds — even light can travel a bare three million meters in that time span — which is focussed into small semiconductor structures called waveguides which hold the light in narrow ribbons much smaller in width than a human hair. The light is so intense that it alters the optical properties of the semiconductor. By altering the intensity of the pulse, scientists are hoping to make it possible to alter from which part of the semiconductor structure the pulse of light emerges and thus switch the pulse around. This is believed to be the fastest switch developed so far. (*The Economic Times*, 16th Nov. '91).

LASER GUIDANCE TECHNOLOGY DEVELOPED

Defence scientists at Dehradun have made a breakthrough in indigenous development of laser guidance technology paving the way for rapid modernisation of weapons systems.

The landmark achievement has been made by scientists at the Instruments Research and Development Establishment (IRDE), one of the institutes under the Defence Research & Development Organisation (DRDO). Laser guidance will help precision bombing by missiles and bombers thereby greatly improving the striking power of the Indian air force. "What we have is state-of-the-art technology that was used in the recent high-tech war in the Gulf", said IRDE Joint Director, Dr. K.K. Mohan Rao.

The new lasers are made by alternating one or more layers of indium gallium arsenide with layers of indium gallium arsenide phosphide. The thin layers that constitute the laser head are a mere 400 atoms thick. The researchers etch away some material to leave the tiny thumb-tack-shaped structures that can emit laser light in several directions. The new lasers operate at extremely low power levels, so they would be well suited as light sources for future optical switches.

With the development of this sensitive technology, India has joined the ranks of France and the United States. The 31 year old IRDE is the single major equipment-oriented laboratory within DRDO which designs, develops and produces precision instruments to all three defence services. The Institute has also developed advanced laser and infra-red guidance systems for Indian missiles Prithvi & Nag.

The surface-to-air missile Prithvi will be fitted with the IRDE developed Laser Attitude Switch (LAS) that is designed to explode the missile warhead between 35 and 45 meters above the surface to cause maximum damage. An advanced homing device for India's third generation anti-tank Nag missile is also undergoing final tests at IRDE. India will be the first country to introduce this sophisticated homing device for the missile. It would be ready to be fitted into Nag during 1992. The main battle tank Arjun is also fitted with a laser warning device developed at IRDE to warn the tank crew in case the enemy was also using laser to spot it. (*TOINS*, 11th Nov. 1991).

BREAKTHROUGH IN LASER TECHNOLOGY

The defence scientists of the Institute of Armament Technology (IAT) at Pune have achieved a breakthrough in indigenous laser technology by successfully designing, fabricating and operating a copper bromide laser. This is perhaps the first laser of its kind in the country and puts India in the league of the few highly developed nations in the world to possess the technology. The copper bromide laser works in the green region of the spectrum and has significant applications is under-water ranging and commuuncations.

The existence of the laser was disclosed by Air Vice Marshal U.A. Deshpande, Director and Dean of the IAT while presenting the annual report at the 41st convocation of the IAT. It is the only institute where, officers of all three services, as well as the scientists and technologists from defence research organisations, ordinance factories and public sector undertakings work and train.

Dr. V.S. Arunachalam, scientific advisor to the Defence Ministry, explained that most nations were developing submarines as these served as "strategic undetectable platforms" in the sea. However, the green copper bromide laser was capable of penetrating the sea-water and provided a means of accurately guaging objects (*TOINS*, 19th Dec. 1991).

MICROLASER: BREAKING NEW GROUNDS

With the recent development of a solid-state microlaser by MBB, German researchers have reached a turning point in microsystems technology. The main goal of microsystems technology (MST) is to integrate microelectronic, micromechanical and microoperatical functions in complex, highly miniatured systems on a single silicon chip.

The first two steps — integrating microelectronic and micromechanical functions — have been realised thanks to production methods borrowed from semiconductor technology. Integrating microoptical functions, however, is still in its infancy.

MBB in Germany has now reached a turning point in integrating the three technologies on a single chip with the design of a solid-state laser. The long term objective of MBB's corporate engineering division is to implement a microsystems technology laser in which mechanical, thermal, optical and electronic systems interact on a minute scale.

The development of the microlaser will involve several stages. In the first stage, which MBB has already reached, semiconductor laser diodes are used in place of discharge lamps as the exacter for a solid-state laser. In the second state, which has also been initiated, packaging and assembling engineering techniques from the field of hybrid electronics will be applied to significantly reduce the size of the laser. In the planned third stage, the manufacturing methods developed in microelectronics are to be used to integrate a laser on a silicon chip.

Laser is an acronym for light amplification by stimulated emission of radiation. Today, the variety of materials

which may be used as lashing media is very extensive. Laser light can be generated not only with various gases, solids and semi-conductors, but also with certain liquid dyes and even with free electrons modulated by periodic magnetic field (the free-electron laser).

The means of excitation varies from one medium to another. In addition to light and electrical current, chemical reactions can also stimulate laser emission. Fundamentally, however, the process is always the same; light is amplified by stimulated emission. A laser beam is created by repeatedly reflecting light through the amplifying medium between two parallel mirrors. The beam forms along the resonator's optical axis. Since one of the mirrors is partially transparent, part of the radiation leaves the device as a beam of coherent light.

Ever laser emits highly ordered energy, with wavelengths in all parts of the visible range, from 0.1 micrometre to 1 mm. The spectrum ranges from the emission lines of inert-gas-halogenide lasers in the ultraviolet to those of molecular gas lasers in the far infrared. Laser beams differ from the radiation emitted by other artificial and natural light source in their high radiance i.e. their light emission per unit surface area and soid angle. Compared to the greatest radiance of the sun's surface within the visible range, the radiance of a small helium-neon measuring laser is five orders of magnitude greater. Thanks to their small diameter and small angle of divergence, laser beams can be focused on a very small spot. This characteristic is what makes laser suitable for a wide variety of applications in materials processing, medicine and data storage and retrieval.

The narrow spectral width of the emission is a prerequisite for laser applications in broadband communications, holography and interferometric metrology. Most gas and solid-state lasers are excited by means of gas discharges and are consequently inefficient, voluminous, sensitive to slight mal adjustments and limited in their service life. This is the reason for the limited use of laser in aerospace applications, although their special beam properties would make them very suitable for a number of such applications in sensor technology, communication and remote sensing.

Only semiconductor laser (laser diodes) offer the essential advantages of compactness, efficiency and ruggedness, and are widely used in telecommunications, CD scanning, laser printers and laser scanners. For many applications, however, the large angle of divergence and broad emission spectrum of the laser diodes is a significant disadvantage, rendering them unsuitable for precision work in electronics or for power transmission via optical fibers in survey. Furthermore, their board emission spectrum limits their use in interferometric metrology and data transmission.

A future, novel type of high-quality laser source is to provide not only higher beam quality than that of laser diodes, but also a broader selection of laser wavelengths. The present laser generations ModilLas and HybridLas developed by MBB's Central Laboratories and the future microlaser use a combination of semi-conductor and solid-state laser to achieve the important improvement in physical properties and technical features described above.

Despite the disadvantages described earlier, laser diodes, as narrow-band, efficient sources of light with a low-voltage power supply and a long service life, will find use as exciters for various solid-state lasers. The major advantage of this combined laser system consists in the increase in spectral radiance. Solid-state lasers have the special capacity to produce very short pulses with high peak power. They do this by storing energy over long intervals of time at the stimulated level of the laser medium. MBB's ModiLas devices find application primarily in metrology and test engineering and in high-precision structural engineering in the electronics industry. ModiLas is used for high precision machining of material and in micro-electronics for engraving, scribing, soldering and trimming.

A future, extended version of the ModiLas could be considered for use in surgery, an application now filled by MBB's well-known medical laser ModiLas. MBB's other new development, the HybridLas would be suitable for application in metrology and test engineering, in chemical analysis and medical diagnosis.

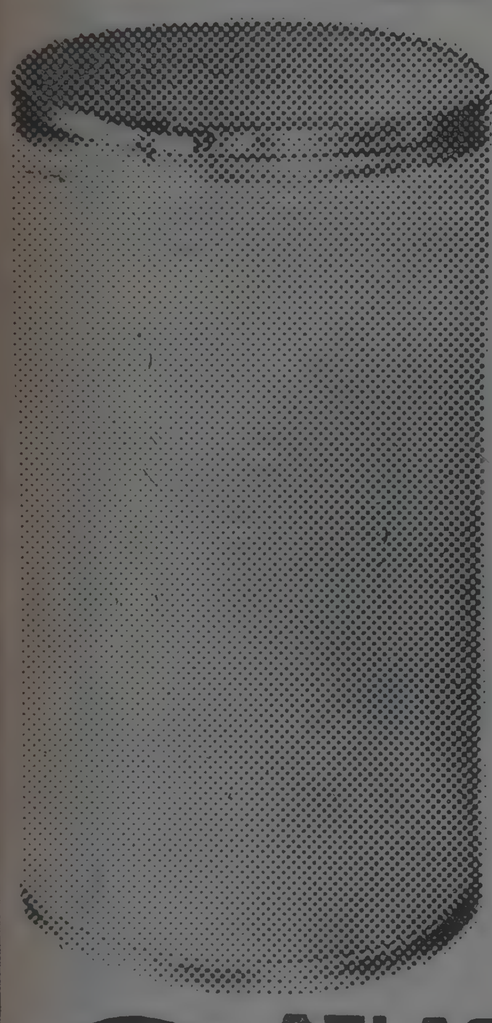
In contrast to ModiLas, which is manufactured "conventionally" using discrete components, HybridLas is fabricated using thick-film technology, in which the individual electronic components are deposited on ceramic substrate.

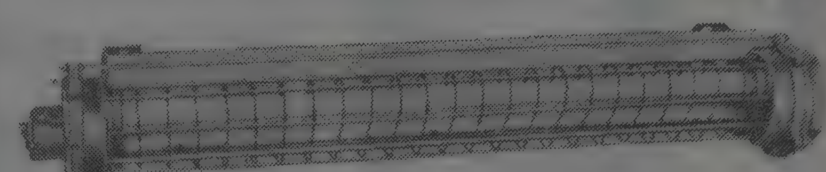
The technology, which is being used for the first time to construct a solid-state laser, is suitable for installation in ground vehicles, aircraft or satellites. The third stage of miniaturization in the microlaser is to unite all the laser's functions on a silicon substrate.

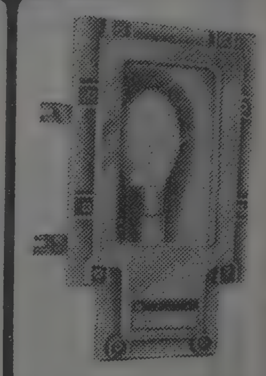
The first function is mounting and fixing all the components on an optical support structure. The second function is the dissipation of excess heat from the electronic and optical components.

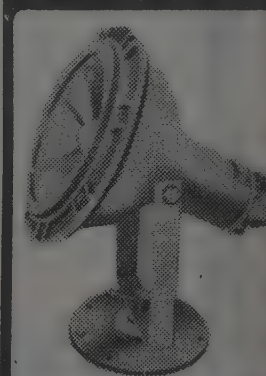
The advantages of the microlaser over the hybrid laser will be greater output power, increased efficiency, smaller volume and reduced production costs.

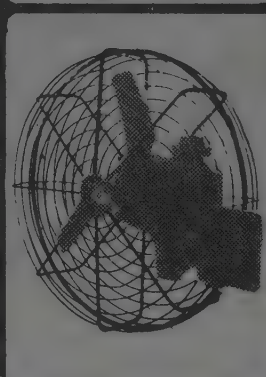
With its smaller structure, the microlaser will be less sensitive to shocks and vibrations. On the other hand it will require more efficient cooling and faster and more precise temperature control. (*New Tech News*).

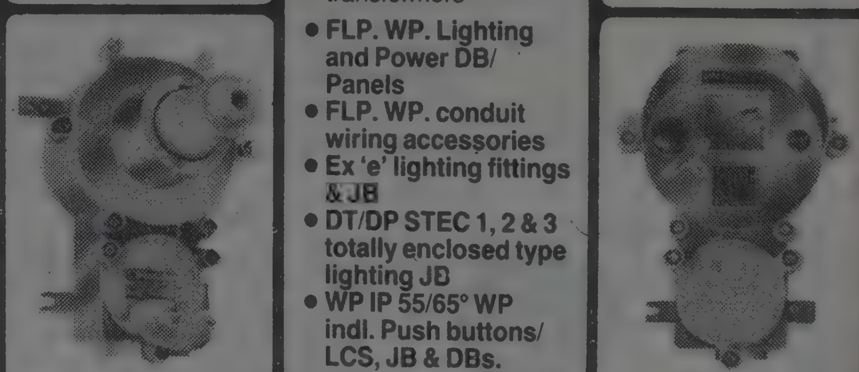












New Products and Processes

WESSALITH DAY, A NEW ZEOLITE FOR SOLVENT RECOVERY AND WASTE GAS PURIFICATION

Degussa AG of Frankfurt am Main has developed Wessalith DAY — a new hydrophobic molecular sieve, which originates from a Y-zeolite dealuminated according to a special Degussa procedure. The zeolite is preferably employed in solvent recovery and waste gas purificagtion.

The dealuminated zeolite features a high silicium/aluminium-ratio, which provides high chemical resistance towards acid fluids and reduces catalytic activity. Wessalith DAY is non-flammable and temperature stable up to more than 1,000 °C. Due to its hydrophobic properties it is particularly suitable for selective adsorption of non-polar molecules from exhaust air streams having high relative humidity. Its well-defined port diameter of 0.8 nm (8.0 A) allows adsorption of all conventional solvents.

DAY is available in various forms (of high mechanical stability) such as powder for coating, 2nd and 4 mm pellets and hollow cylinders tailored to match different applications in rotor- and fixed-bed-technologies.

These applications include adsorption of unstable, decomposable solvents and components that tend to polymerize. The zeolite is most effectively regenerated by hot air or inert gas. Low specific energy consumption can be accomplished by high desorption temperature. The DAY zeolite is being tested in combination with catalytic/-thermal combustion, condensation, and as a buffer to smooth down concentration peaks.

For more details, contact: Degussa AG, Public Relations, Postfach 110533, D-6000 Frankfurt 11, Germany.

CATALYTIC CONVERTERS

Degussa AG, is presenting its range of catalytic converters for the purification of flue gases and emissions from stationary engines. It produces three-way and oxidation catalytic converters for the purfication of exhaust emissions from stationary engines, for instance in block-type thermal power stations, which operate according to similar principles as those used to detoxify exhaust emissions from automobile engines.

Pellet or monolith catalytic converters of an appropriate design on a precious-metal basis or complete systems are used for flue gas purification. Specific concepts are available for the chemical industry, the pharmaceutical industry, printing shops, paint manufacturers and processors, petrochemical plants, refineries, curing and roasting plants.

These complete plants are developed and marketed in conjunction with partners from the plant engineering sector.

For more details, contact: Degussa AG, Public Relations, Postfach 110533, D-6000 Frankfurt 11, Germany.

AIR SUPPORTED SHELTERS

Technolab walk in air support membrane (plastic) chambers are specifically designed for proto type processes and experiments covering such fields as quality assurance testing, agriculture etc. They are plastic membrane housings air supported with air locks at entry points. The chamber is kept at slight positive pressure, environment such as mist (humidified for plant nurseries), carbon dioxide, temp. upto 40°C and humidity (for green houses), nitrogen (anaerobic bacteria cultivation in biotechnology), salt spray (quality assurance tests for electronics components etc.), humidity and heat (CQA tests etc.) are possible. Because of plastic construction and low cost it is suitable for portable, small scale and scientific laboratory application. Option: Hand cloves, part light transparent plastic, environment developers like salt spray, gas analysis instrumentation. Sizes: 1 m³ to 8 m³ chamber size.

For more information, contact: Technolab Instruments (Madras), 18/1A, Poonamallee High Road, Maduravoyal, Madras 602 102.

INDUSTRIAL SILICONES

Plastic membrane tanks low height type with different composites like Nylon-PVC, Nylon-Neoprene etc. are available to store difficult liquids and gases. The tanks are provided with inlet and outlet valves of plastic. Sizes from 1 m³ to 10 m³ are available.

For more information, contact: Industrial Silicones, 18/1A, Poonamallee High Road, Maduravoyal, Madras 602 102.

POLYURETHANE PRESERVES CONCRETE IN HELSINKI STADIUM

Over the next three years, Helsinki's Olympic Stadium, which was built in 1938, is to undergo a modernization programme in preparation for the European Atheletics Championships which are to be held in the Finnish capital in 1994. One important talk involves treating a total of 36,000 m² of concrete terracing and strands with a durable, seamless and waterproof "Oldroof" seal as a protection against weathering. This solvent-free, flame-retarded and UV-stabilized polyurethane elastomer, supplied by Messrs. Busing & Fash of Oldenburg, Germany, is formulated from Baytec raw materials from Bayer AG, Leverkusen, Germany.

The first 10,000 m² are currently being coated by the Uretek-Elastomer

Some 36,000 sq.m. of concrete terracing and stands in the Helsinki Olympic Stadium are to be coated with "Oldoroof", a solvent-free, flame-retarded and UV-stabilized PU elastomer from Busing & Fasch, Oldenburg. The elastoer system is based on Baytec raw materials from Bayer AG.

Oy company of Tampere. After preparing the concrete substrate and applying a primer, a two-component spray unit is used to coat all flat surfaces, corners, edgings and flashings with a seamless layer of elastomer approximately 3 mm thick. This waterproof coating solidifies in a few seconds, becomes tack-free in a matter of minutes and can be walked on only 20 to 30 minutes after application. The elastomer is then sealed with an elastic, matt, light-stable top coat.

This reactive polyurethane elastomer system can also be used to give a durable, seamless and waterproof seal to building component in many other areas of civil engineering.

For more information contact: Bayer AG, Public Relations Department, Corporate Staff Division, D-5090, Leverkusen, Bayerwerk, Germany.

APPLICATION OF FILTROCEM POWDER IN DETERGENT

In this world where technology advancing rapidly and in this new decade of environment consciousness several invention takes place. M/s. Clays & Refractories Industry of Jodhpur produce a natural zeolite type product named FILTROCEM POWDER. It is basically amorphous precipitated silica which is highly active. It is very light in weight and tapped bulk density is 0.3 to 0.4 gm/cc. It has very large surface area which is about 67 m^2/gm, it is highly absorptive product and having own scouring property. The consistency in the pore volume help activity of surfactant and improves the detergency property. Due to high absorption capacity it helps prevention of caking while formulation and after that it helps detergent powder free flowing due to low density it covers more surface area.

Due to it's low density and active silica it absorbs more active agent and help rapid cleaning of cloths. Average particle size of filtrocem powder is 4.7 µm which passes through cloth and also helps to improve the glazing of washed cloth.

It is recommended to consume 5 to 10% Filtrocem Powder depending on other ingredients used with it. Major caution is that while using this product one must be careful about the pigment colour combination because it is highly absortive so if it is not properly formulated then it decolourises and damages brightness, so colour stabiliser must be used with this product.

The chemical and physical properties are as follows:

Chemical Composition: Silica 78 to 85%; alumina 6 to 8%; ferric oxide 0.6 to 1.5%; calcium oxide 1.5 to 2%; magnesium oxide 1 to 1.5%; sodium and potassium oxide 1 to 2%; loss on ignition 6 to 10%.

Physio-chemical properties: pH of 10% solution - 8 to 9; moisture at 105°C - 6 to 10%; bulk density (after 50 taps) - 0.38 to 0.45 gm/cc; specific gravity -1.15 to 1.18; water absorption - 80 to 90%; and oil absorption - 85 to 95%.

GUT 90 G
(A granulated precipitation and flocculation agent for the treatment of industrial effluent)

Degussa AG, of Frankfurt am Main, has launched a granulated precipitation and flocculation agent for use in the treatment of industrial effluent. GUT 90 G is based on a synthetic sodium-aluminium silicate which exhibits an extremely high ion exchange capacity and affinity for heavy-metal ions such as AG^{+}, Ti^{+}, Ba^{2+}, Cd^{2+}, Cu^{2+}, Ni^{2+}, Pb^{2+}, Sn^{2+}, Sr^{2+}, Zn^{2+}, Au^{3+}, Cr^{3+} or Fe^{3+}. In addition to reducing the residual ionic concentration, GUT 90 G results in improved flocculation and sedimentation in the precipitation stage. The compression properties of sludges are moreover enhanced, leading to a higher solid content. A further effect is the lower COD value achieved by binding organic contamination.

On the strength of these properties, GUT 90 G can be used for a wide range of applications in the surface-processing industry. GUT 90 G's granules form means that it has a high bulk weight, for straightforward, dust-free handling. As a result of the special granulating method used, the granulate disintegrates rapidly, releasing the active agents in the process. GUT 90 G is easy to use; it can be added directly to the neutralisation stage, as it achieves optimum effect in alkaline conditions. It can also be added in a second precipitation stage later on in the process. It can easaily be dispensed by hand or with the aid of an automatic device, so that no complex apparatus is required.

For more information, contact: Degussa AG, Public Relations, Postfach 110533, D-6000 Frankfurt 11, Germany.

BOLTED BULK STORAGE SILO

Storage space is expensive. As industry handles more and more materials,

the need for economical bulk storage increases. Dry bulk solids like powders, pellets, and granules can be stored economically in bolted storage tanks. These bolted tanks are available in standard sizes complete with interior coating to protect against corrosion and abrasion. They can be used to store a wide srange of foodgrains, minerals, chemicals, plasatics, etc. Bolted tanks are factory made and are shipped in convenient knocked down sizes ready for site erection. This pre-engineering saves time and the cost of these tanks are considerably lesser than site build welded tanks. This new concept of bolted tanks is pioneered by SCORPIO. Welded tanks are also available with factory built tank sheets.

For further information contact: Scorpio Engineering Pvt. Ltd., 132, Wheeler Road, Cox Town, Bangalore 560 005.

NEW PROCESSES FROM DEGUSSA AG

EFFECTIVE PROCESSES OF CYANIDE DETOXIFICATION

Degussa offers highly effective methods for the purification of effluent and emissions in hardening shops, electroplating plants and the chemical energy-generating industries, for instance. One major area is the utilisation for energy purposes of purified blast-furnace gas containing hydrocyanic acid, as generated in the steel production process.

Blast-furnace gas washings from the wet-scrubbing process contain varying concentrations of cyanide. The patented process is based on the conversion of cyanides into glycolonitrile. A separate flow is diverted from the scrubbing circuit and the chemical requirements calculated. In accordance with the redox potential for cyanide, formaldehyde is dosed into the main washings flow; here, the HCN is converted quantitatively into biodegradable products. Since the cyanide is destroyed, no heavy metal cyanides can form, nor can hydrocyanic acid escape into the atmosphere via the cooling air. The pH value of the water extracted from the circuit is raised by the addition of caustic soda and glycolonitrile subjected to perhydrolysis by means of hydrogen peroxide. The products of this reaction are readily biodegradable.

The Degussa process requires little space for dosing or control equipment, involves rapid reactions and enables the CN concentration to be reduced in accordance with the legal limits.

DECONTAMINATING GROUND POLLUTED BY MINERAL OIL

A method of decontaminating ground which is polluted by mineral oil has been developed by Degussa AG, of Frankfurt am Main, utilising the natural self-cleaning effect of the ground. The mineral oil impurities are converted almost entirely into non-toxic carbon dioxide by micro organisms already present in the ground.

The process is activated and therefore significantly speeded up by the addition of the missing nutrients and above all of hydrogen peroxide.

The process involves installing a closed water circuit in the area of contaminated ground (system of infiltration and intake wells). Water containing the nutrient and H_2O_2 is passed through the contaminated zone. The micro-organisms receive an optimum supply of nutrients, enabling them to break down the contamination rapidly. After extraction, the water is cleaned above the surface and reinfiltrated after nutrients have been added, completing the water cycle.

ELIMINATING POLLUTANTS IN WATER BY MEANS OF ACTIVATED HYDROGEN PEROXIDE (H_2O_2/UV, H_2O_2/O_3

The heavy burden we impose on our lakes and rivers necessitates correspondingly intricate methods of water treatment. Substances which are hard to break down, such as aliphatic and aromatic hydrocarbons, pesticides etc., represent very serious problems. The physical and chemical processes so far used do not completely eliminate certain substances which represent a health hazard.

One alternative method currently being discussed worldwide is based on oxidizing pollutants by means of OH radicals. These very reactive radicals (oxidation potential 2.8 V) are produced by means of systems such as H_2O_2/UV H_2O_2/O_3, H_2O_2/metals, O_3/UV or even a three-fold combination of H_2O_2/O_2/ UV_2 and H_2O_2/O_3 have proved to be very interesting. The hydrogen peroxide used is produced by the Degussa AG company of Frankfurt am Main.

Experience to date and information material can be obtained on using these processes for treating drinking water, process water, seepage and sewage.

REMOVING SULPHUR FROM PROCESS AND FLUE GASES WITH HYDROGEN PEROXIDE

The Degussa AG has been successfully using its own H_2O_2 process for more than 10 years on a large scale for desulphurizing process gases. In the meantime the H_2O_2 process, on which development is continuing, is being used to excellent effect to remove sulphur from flue gases as well. Degussa has built a pilot plant to investigate separation efficiency and the effects of dust, heavy metals, hydrogen fluoride and hydrocarbons, and to examine matters relating to corrosion. The process of desulphurizing flue gases with H_2O_2 was developed at this plant and successfully underwent two years of long-term testing.

Today two successfully tested and mature processes are available, operating without producing sewage or refuse, providing pure, recycled sulphuric acid as the end-product and capable of desulphurizing process and flue gases almost completely.

RECYCLING OF PRECIOUS METALS FROM EXHAUST CATALYTIC CONVERTERS AND PHOTOCHEMICAL WASTE

For many years now, Degussa has been operating economical processes for the recovery of platinum metals, and in particular the most valuable precious metal rhodium, from automobile catalytic converters. It currently processes scrap converters from both Europe and elsewhere, with considerable amounts likely to be generated on European markets over the next few years. In view of this trend, the company has developed an even more economical process which has already been tested in practice.

Scrap catalytic converters are melted down together with scorification additives in a high-temperature electric furnace, which platinum metals are amassed by a collector metal, concentrated and recovered in their pure form in a further stage by wet chemical processes. The fused ceramic base material forms a solid, water-insoluble slag. This environmentally neutral substance is then used industrially or dumped.

The new recovery process is significantly more economical than conventional refining processes. Degussa, one of the leading European and worldwide manufactrers of catalysts, has thus created an intact, economical recycling system, from the precious metal coating of automotive catalytic converters, through the efficient, environmentally friendly recovery of the platinum metals used, to their re-use in new catalytic converters.

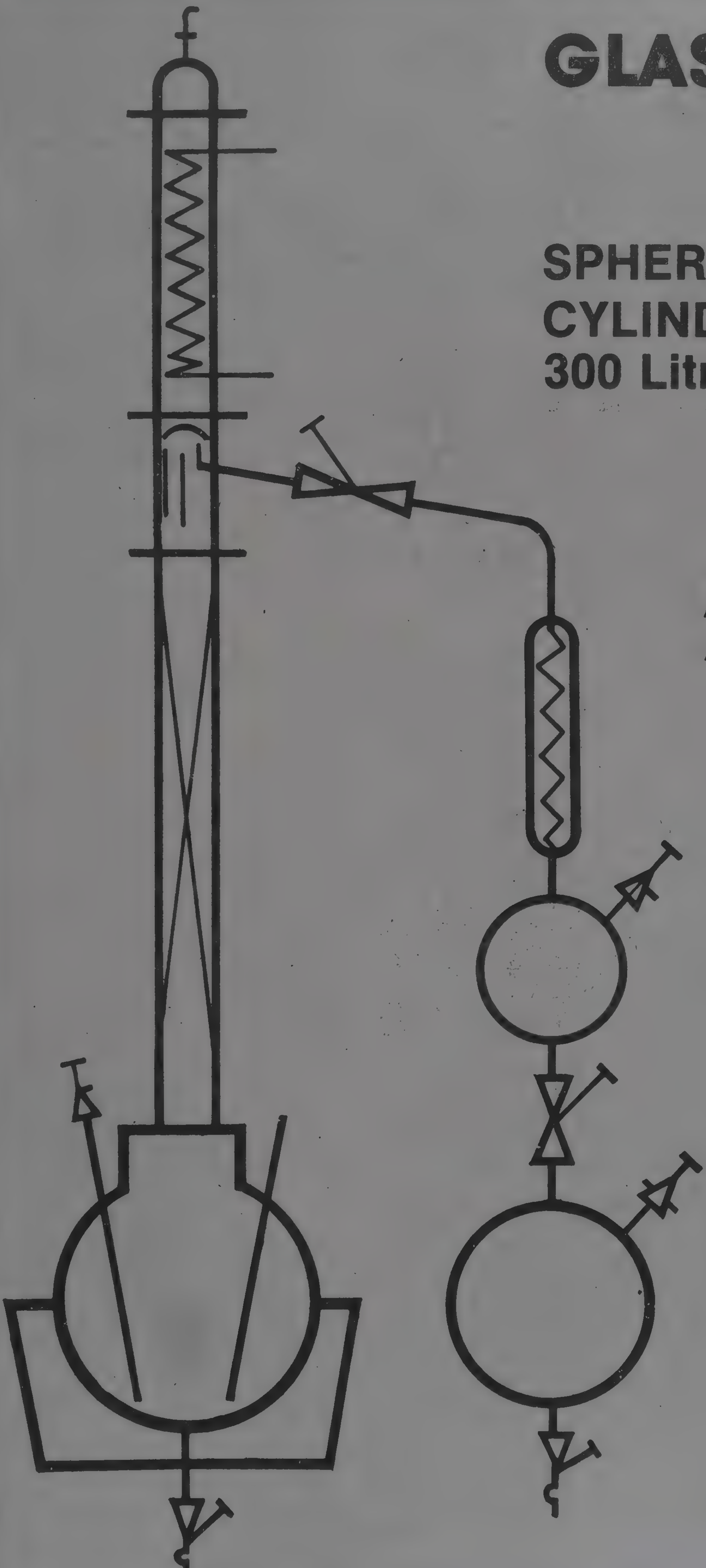
Silver, an essential component of photographic processing in the form of silver nitrate, is recovered both from scrap films and above all from sludges and emulsions generated in the film and photographic paper production process and which contain silver. Further starting materials include electrolytic silver deposits from photochemical effluents, ion exchangers and steel wool.

The diverse composition of materials and the variety of delivery forms necessitate specific sampling methods for analysis, to ensure that the silver content can be determined precisely and rapidly. There is a wide variety of silver recovery processes and process variants, for maximum precious-metal yield.

The recovery of residue containing silver from the photochemical industry results in fresh raw materials, for example for the production of silver nitrate, and makes a worthwhile contribution towards pro-environmental disposal.

NATIONAL CONFERENCE OF INDIAN MEMBRANE SOCIETY

The 10th National Conference of Indian Membrane Society, is scheduled to be held during January 21-22, 1993, at BARC, Bombay. For more information please contact Dr. B.R. Misra, Convenor, Desalination Division, Bhabha Atomic Research Centre, Bombay-400 085. (Tel. 556 3060 Ext. 4759, Fax: 011-91-22- 556 0750; Telex: 011-72322 BARC IN).



Carbon Dioxide Deliming — An Environmentally Friendly option for Indian Tanneries

H. PURUSHOTHAM, N.K. CHANDRABABU, J.K. KHANNA & K.V. RAGHAVAN
Central Leather Research Institute, Madras 600 020

Introduction

Increasing environmental pressures are forcing tanneries to reduce the level of nitrogenous compounds in their effluents. The past few years have witnessed stricter regulations on effluent quality at national and international levels. One area under particular scrutiny of late is the discharge of nitrogen compounds. A major contributor to this problem is the use of ammonium salts in the deliming operation. Figure 1 highlights the ammonia found in the effluent at various stages of leather processing. This led to the development of carbon dioxide deliming process(1), which fulfils both technological and environmental requirements. This technology is being used in more than 40 tanneries in Central Europe and the USA.

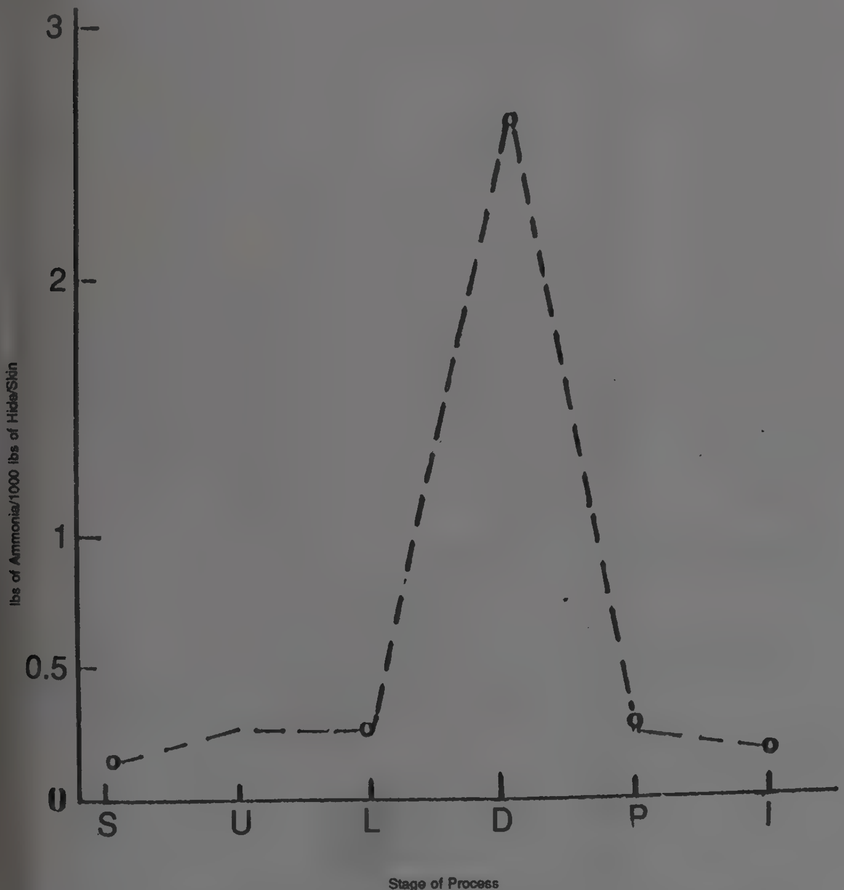


Fig. 1: Ammonia found in the effluent at various stages of leather processing

Advantages of Carbon dioxide Deliming

There are several advantages associated with the carbon dioxide deliming process that makes it an attractive alternative to conventional deliming technique. These include:

1. Reduction in discharge of nitrogen compounds in the effluent.
2. Reduced ammonia odor in the plant.
3. Achievement of BOD reduction of upto 50%.
4. Easier handling.
5. Easy adaptability to automation.
6. Improved quality in terms of refined and cleaner grain and improvement in the degreasing action.
7. Reduced risk of acid shock and achievement of gradual reduction in pH.

The paper reviews the current knowledge of the carbondioxide deliming technology and highlights the efforts of CLRI to adapt carbondioxide deliming technology to Indian conditions and the results obtained thereof in CLRI pilot plant.

The concept of carbondioxide deliming dates back approximately 100 years when tanners experimented with carbondioxide in both solid (dry ice) and gaseous form. The most significant early work was reported by Edwin Ochs(2) in the early 50s. He was able to delime successfully kid leather using carbondioxide. His technique, however, did not gain acceptance in the industry since it added time to the deliming process and environmental regulations did not exist at that time to motivate tanners to seek alternatives to ammonium sulfate/chloride. Due to growing environmental restrictions, and the inherent advantages of deliming with carbondioxide, the process has been re-examined recently and suitable refinement techniques have been incorporated by Munz(1) and Klasse(3) and co-workers.

Ammonium sulfate and ammonium chloride are ideally suited to meet the technological requirements of deliming. They both:

* react readily with lime and produces delimed pelts of good quality.
* act as buffers and thus do not affect leather quality even when added in excess and
* are inexpensive to use.

However, they adversely affect waste-water treatment and create unpleasant working conditions. The other deliming agents frequently used in the deliming operation are boric acid, formic acid, citric acid and lactic acid. They are found to effectively delime, not to cause waste water problems and are fairly inexpensive. Their introduction into the float, however, create localised areas of low pH. This can cause "acid shock'' and result in ''drawn grain", especially when they

are added in excess. Carbon dioxide effectively incorporates the positive qualities of the above-mentioned chemicals without the negative environmental impact. It has a high affinity for lime, buffers in the float at pH of 6.5 -7.0 and is inexpensive to use.

Physico Chemical Aspects

Carbon dioxide is a colourless, odourless, non-combustible gas. It dissolves readily in water forming carbonic acid (a weak acid) and its solubility is dependent upon temperature and pressure (Figure 2). Lower temperatures and higher pressures favour higher gas solubility(6).

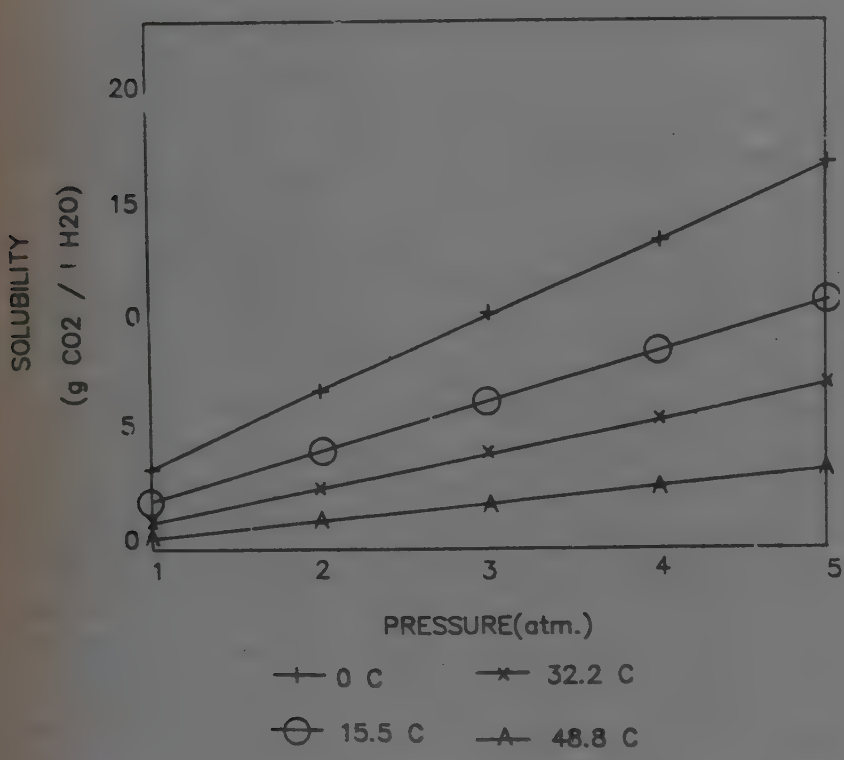


Fig. 2: Solubility of carbon dioxide in water

The means of introducing carbondioxide for the deliming operation depend upon the type of equipment used for deliming. In drums, carbondioxide is typically injected in gaseous form through the gudgeon and into the lead space above the float (1). Being heavier than air, the carbondioxide will settle at the surface and will readily dissolve into the water to begin the deliming process. If the drum is equipped with a recirculation system, the carbondioxide can be added directly into the recirculating liquid. The second method is preferred since it provides a more efficient mixing of the carbondioxide. No work is, however, reported in this direction.

The chemistry of carbondioxide—lime interaction is fairly straightforward and is shown below. Carbon dioxide reacts with the lime in the skins/hides to form calcium bicarbonate (a water soluble salt). There is a fear among tanners that insoluble calcium carbonate will form and will result in lime blast to the skins/hides. Various tests carried out at CLRI on lea ers including chemical and scanning electron microscope st dies indicate that the lime blast does not occur under t controlled conditions as followed in the present process. Ev if it forms the weak carbonic acid dissolves the nearly ins uble calcium carbonate and forms the easily soluble calciu bicarbonate:

$$Ca(OH)_2 + 2CO_2 \longrightarrow Ca(HCO_3)_2$$

Process Technology

A system for carbondioxide deliming is as practised CLRI pilot facility is shown in Figure 3. The deliming pr cess runs at the customary float level of 150% in usual drum where carbondioxide is injected through the hollow axle in the recirculation line, depending upon the need. Carbo dioxide is obtained from a bundle of cylinders. The who process can be automated to avoid physical handling of delim ing agents. When using closed systems, pressure equilisatio is necessary. The pH control is performed in the convention way for the skin/hide and with the help of pH controller fo circulating float. Carbondioxide flow into the individu drums is closely monitored with appropriate instrumentatio as shown in Figure 3. In its simplest form, a manually oper ated ball valve can be used to manually regulate carbond oxide flow into the drum. This equipment can be upgrade to timer-controlled or computer control system.

The experiments have been conducted by cutting the skins hides into two halves, and a batch of one half is delimed wit ammonium sulphate, while the other half is treated with car bondioxide. Bating, pickling and chrome tanning and othe post-tanning operations are same for the further processing of delimed material.

Critical Process Parameters

Operating parameters which can have a significant impac on the effectiveness of the carbondioxide deliming process are: time, temperature, float, bate treatment and carbondioxide addition rate.

The process duration of carbondioxide deliming depends on the pelt thickness. For usual shoes upper or upholstery leathers, the process duration is comparable, to the conventional deliming. Due to the presence of free carbonic acid the pH of the float always remains in a neutral range. Bating can, therefore, be started during the deliming process itself. The amount of carbondioxide necessary for deliming is quite comparable to other deliming agents (e.g.) 1-2% of the pelt weight.

A pH comparison between ammonium-sulfate and carbon-dioxide deliming reveals two primary difference (Figure 4).

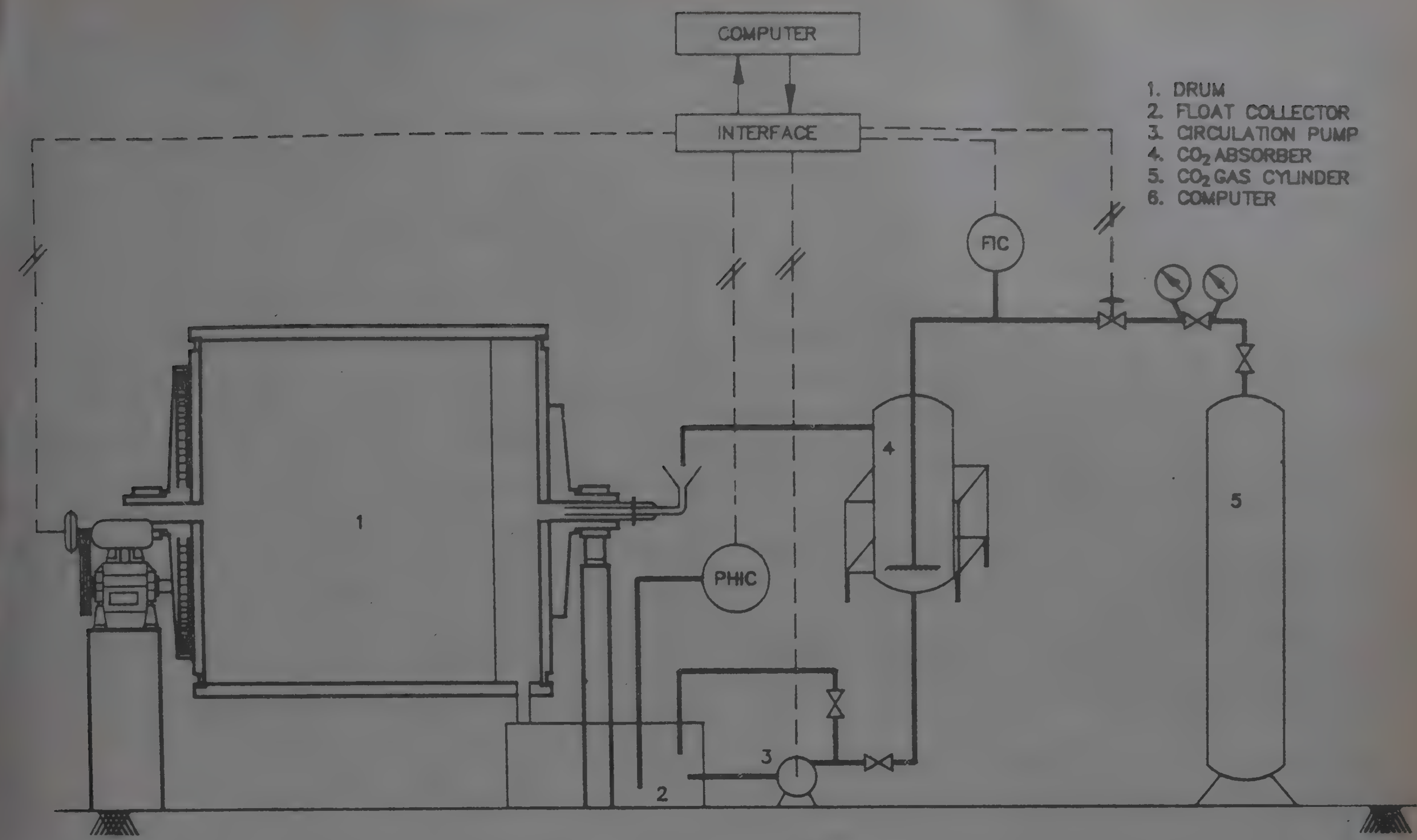


Fig. 3: Carbon dioxide deliming system

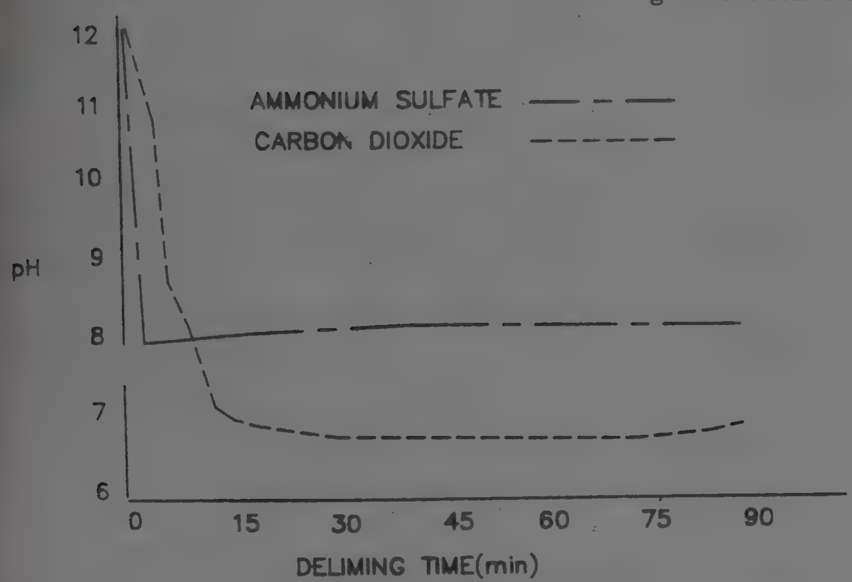


Fig. 4: pH comparison: Ammonium sulphate vs CO_2

The reduction in pH is more gradual with the carbondioxide process. It requires about 10-20 minutes to reach buffering pH during carbondioxide deliming compared to only a few minutes with ammonium sulfate. This slower drop will be less likely to shock the surface of the hides and may result in a more uniform grain structure. Secondly, the buffering pH is lower with carbondioxide than with ammonium sulfate (7 Vs 8.5). This lower pH has caused concern about the formation of hydrogen sulfide. This issue will be addressed later. It also raises concern about bating effectiveness. In most cases, bating action is sufficient at the lower pH. In some cases though a slight excess of bate was needed to achieve the desired properties. Additionally, there are bates available in the market that have high activity at lower pH.

A closer look at the Figure 4 discloses a temporary slowdown in the reduction of pH at about 8.5 representing equilibrium between lime and calcium bicarbonate (1,3). As carbondioxide addition continues, the reaction shifts more towards calcium bicarbonate and pH reduction rate enhances. A slight pH increase is noticed at the completion of the deliming process when the carbondioxide supply is turned off. This is due to the reaction of trace quantities of lime with dissolved carbondioxide in float. This is part of the process optimization and prevents excess carbondioxide from being wastefully drained with the float.

While the duration for the deliming of split pelts for shoe upper and upholstery leather is comparable to that one of a conventional deliming process (e.g.) with ammonium compounds, the deliming of unsplit or thick pelts lasts much longer (i.e.) 4-5 hours or even more (3). Tanners interested in deliming the unusually thick pelts should consider deliming overnight. When the process runs overnight, the exclusive use of carbondioxide makes a complete deliming possible.

Float temperature can greatly influence the rate of deliming process. Theoretically deliming should proceed faster at

low temperature since carbon dioxide solubility is greater. However, experiments carried out by Munz et.al. (3,4,5) at ~~150°C~~, 20°C, 30°C and 35°C indicates the contrary. Changing the float temperature from 150°C to 35°C is found to cut the deliming time to nearly half. This behaviour is due to the enhancement of reaction rates at higher temperature and the ready availability of dissolved carbon dioxide for reaction at the given temperature condition.

The amount of float is also very important. Higher floats allow the dissolution of more carbon dioxide. This extra amount of carbon dioxide in the float will promote a faster removal of lime from the hides and thus speeding up the deliming process. A float level of 150% was found, in most cases, to give good deliming results.

Different processes call for the addition of bate at different points in the deliming process. Adding the bate at the beginning of the deliming step may shorten the time required for the carbon dioxide deliming. This is something that should be evaluated on a case to case basis.

The rate of addition of carbon dioxide is an important factor often. To speed up the process, the flow rate of carbon dioxide can be increased at the beginning of the deliming. This will bring the float down to the buffering pH at a quicker rate and will complete the deliming faster. After the buffering pH is reached, carbon dioxide flow should be decreased to a level just adequate to replace the carbon dioxide needed for reaction with lime.

Since sulfides are used in the unhairing process and are present in the skins/hides, it can be expected that some sulfides will remain in the skins/hides and will be carried on to subsequent processing.

As shown in Figure 5, the chemical form that sulfide will take depends upon pH (3,4). As the pH decreases, HS-ions are formed in the float. They are converted to hydrogen sulfide which is a toxic gas.

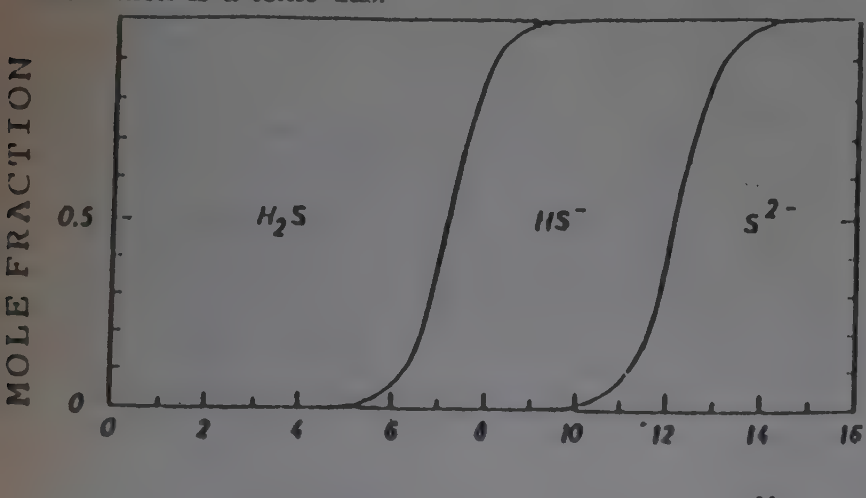


Fig. 5: Relationship between H_2S formation and pH

It is to be noted that if no preventive measures are taken, hydrogen sulfide will be generated even during conventional deliming with ammonium sulfate. This is often overlooked since the hydrogen sulfide odour is masked by the smell of ammonia. Similarly if no measures are taken to prevent it, lower pH levels associated with the carbon dioxide deliming process will contribute to the formation of hydrogen sulfide. Figure 6 shows the formation of hydrogen sulfide during deliming with ammonium sulphate and carbon dioxide. Virtually no sulfides remain in the float associated with carbon dioxide delimed hides. Float from the ammonium sulfate process, on the other hand, contains substantial amount of hydrogen sulfide. This may be carried on to later processing steps to further produce hydrogen sulfide in the pickling and effluent treatment operations. As our objective is to make the deliming process environmentally friendly, it is necessary to minimize the sulfide formation. The best way to remove sulphides is oxidation. Controlling the formation of hydrogen sulfide is critical to the safety of the carbon dioxide deliming operation. Oxidation with hydrogen peroxide was found to be the most effective means of removing the sulfides (3). The chemistry of reaction is shown below:

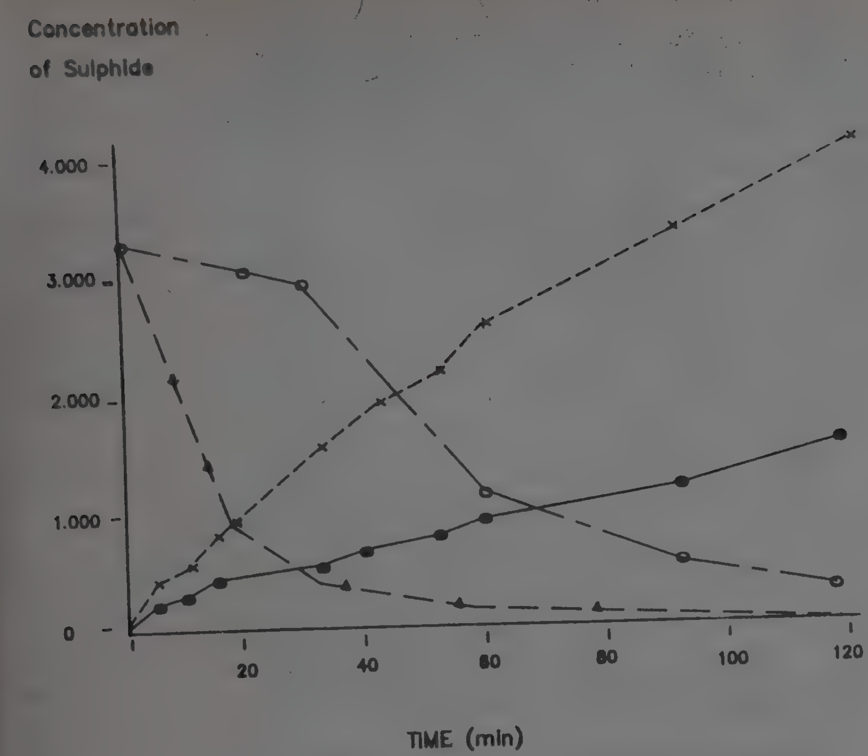
$$S^{2-} + 4H_2O_2 \longrightarrow SO_4^{2-} + 4H_2$$

The amount of peroxide required will depend on a number of factors such as the amount of sulfide used in unhairing step, the number of wash steps performed prior to deliming and the level and temperature of float. Typically, between 0.1% to 1.0% of a 30% hydrogen peroxide solution will be sufficient. This can be added to the float at the time of other chemical additions. Addition of catalyst (e.g.) manganese sulphate will enhance the rate of reaction (3). It is preferable to add the required amount of hydrogen peroxide into the drum before starting the deliming. After 10 minutes under rotation of the drum almost all sulphide is oxidised, and the insertion of carbon dioxide can start. Figure 7 shows the effect of oxidation on removal of sulfides(4).

Leather Properties

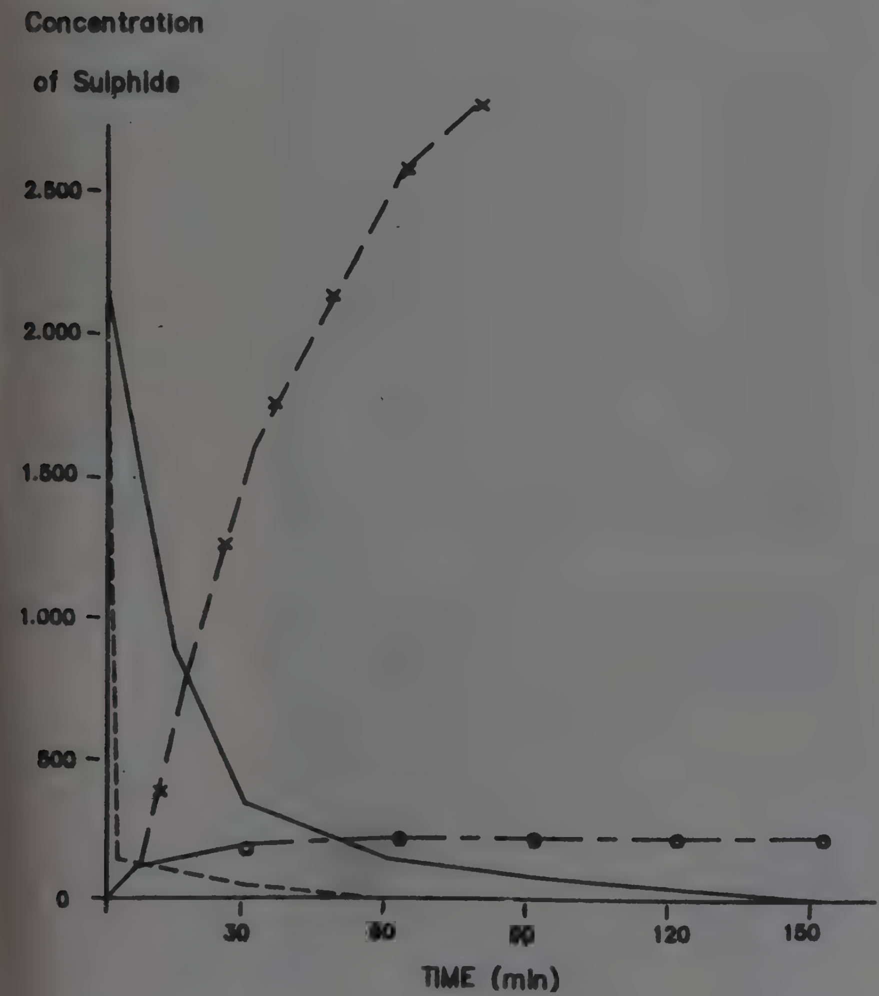
Bench and pilot scale trials at CLRI have not shown the occurrence of lime blasts. A very clean and refined grain was observed in the leathers processed by carbon dioxide deliming as compared to the conventional deliming. This can be attributed to the micro bubble effect. It is also observed that carbon dioxide deliming improves the degreasing effect thereby decreasing the amount of detergent used in the process or use a mild detergent. Physical and chemical properties of leathers obtained by carbon dioxide and the conventional process are shown in Table 1 & 2.

It is very clear from the tabulated data that the physico chemical properties of leathers obtained from carbon dioxide



Formation of H_2 with ammonium sulphate (total mg)
Formation of H_2 with carbon dioxide (total mg)
Remaining Na_2S with ammonium sulphate (mg/l)
Remaining of $Na_2$with carbon dioxide (mg/l)

Fig. 6: Formation of hydrogen sulphide



WITHOUT REMOVAL
mg sodium sulphide/lit.
mg hydrogen sulphide (total)
WITH REMOVAL
mg sodium sulphide/lit
mg hydrogen sulphide (total)

Fig. 7: Sulphide-removal rate

Table - 1

PHYSICAL PROPERTIES OF LEATHER

Mode	Tensile Strength (kg/cm^2)	Percentage elongation	Tongue tear resistance (kg/cm)	Double hold tear switch tear resistance (kg/cm)
Deliming with ammonium sulphate (control)	215.3	50.0	26.5	83.9
Deliming with CO_2 (experiment)	229.2	62.5	27.1	105.8

Table - 2

CHEMICAL CHARACTERISTICS OF LEATHER

Item	CO_2	Ammonium sulphate
Ash (%)	4.84	4.92
Water solubles (%)	1.27	1.28
Cr_2O_3 content (%)	3.73	3.52
Oils and fats (%)	10.50	11.00

are comparable if not better in case of some properties. The deliming with carbon dioxide has not increased the ash content of the leather discounting the formation of calcium carbonate (lime blast). The leather are assessed for feel, grain smoothness, flatness, softness and fullness and are found to be comparable to those leathers obtained from control batches. Figure 8 shows the scanning electron microgram of leathers as produced by carbon dioxide deliming vis a vis conventional deliming.

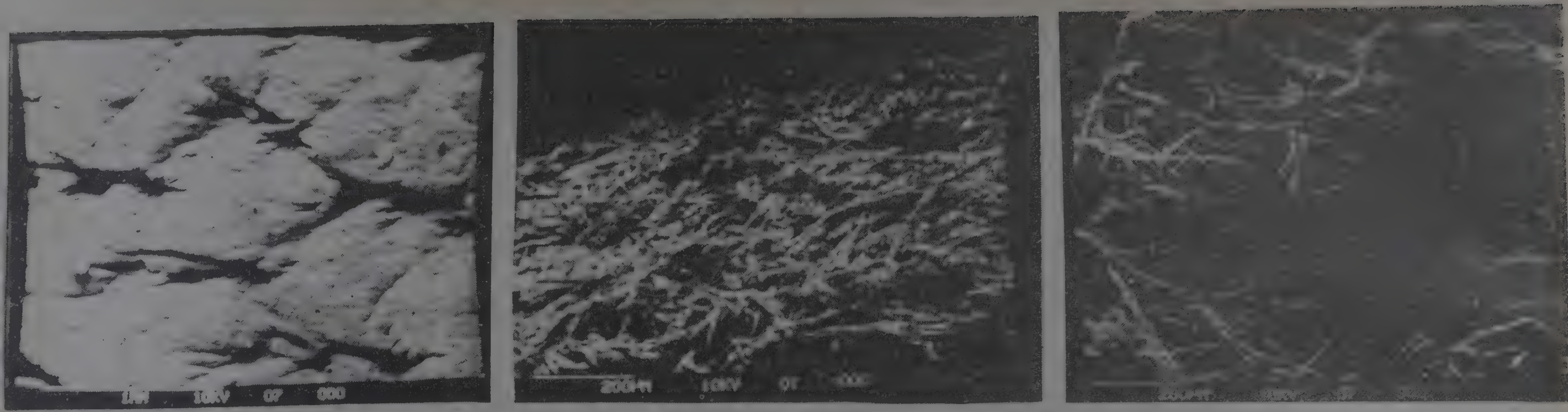
Analysis of Deliming Effluents

Table 3 highlights the comparison of residual deliming floats of conventional and carbon dioxide deliming process. By adopting carbon dioxide deliming process, the chemical load of the waste water is significantly reduced.

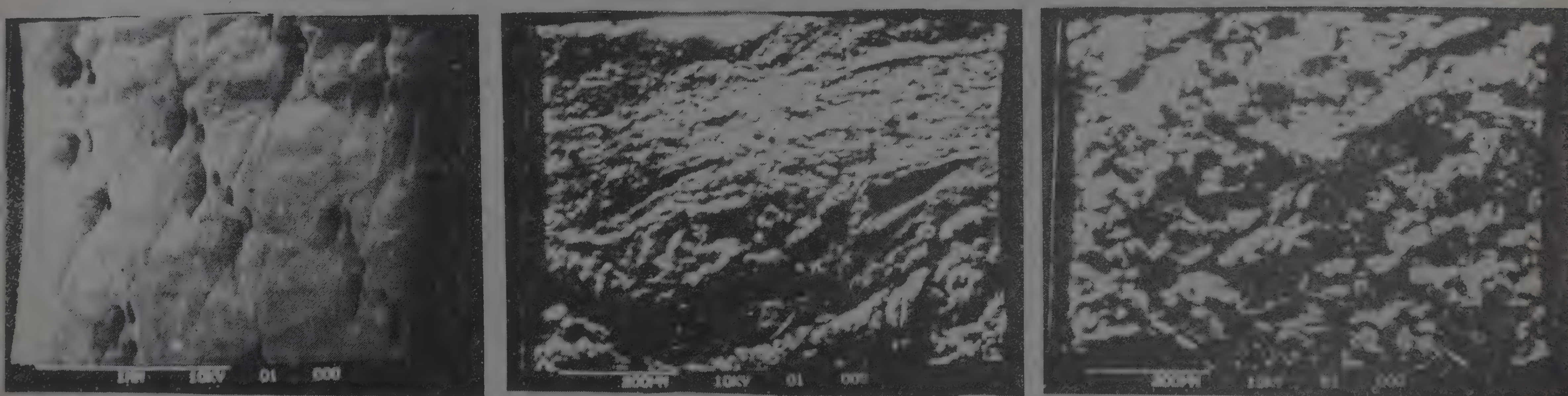
Table - 3

CHARACTERISTICS OF RESIDUAL DELIMING FLOATS

Item	CO_2	Ammonium sulphate
mg Calcium/lit	980.0	870.0
mg Ammonium/lit	6.0	27.0
mg total nitrogen/lit	5.0	22.0
pH	7.3	7.6



(a) Delimed with Ammonium Sulphate



(b) Delimed with Carbon Dioxide

Fig. 8: Scanning Electron Micrograph of Leathers

Table 4
COMPARISON OF ECONOMICS RAW MATERIALS: GOAT SKINS (WT 1000 KG)

Process	Volume/ amount	Cost (Rs.) for Conventional	Cost (Rs.) for CO_2
Washing	150%	15	15
Float	150%	15	15
Ammonium sulphate	1%	60	--
CO_2	1%	--	70
Cost for	**Conventional**		**CO_2**
Auxiliaries	90		100
Treatment cost	30		18
Total	120		118

Economic Considerations

The preliminary cost projections made by CLRI indicates significant reduction in waste treatment costs when carbondioxide deliming is practised. The operating costs are at comparable level and the other advantages of carbondioxide deliming such as cleaner grain and enironmental friendlyness of the process provide distinct edge to carbondioxide deliming process.

Capital costs for installation and service charges for carbondioxide tankers/ cylinders and vaporisers are volume dependent and larger scale operations are economically more attractive.

Conclusion

The results as obtained at CLRI on carbondioxide deliming corroborates the results of earlier investigations (1,2,3,4,5).The benefit of carbondioxide deliming are numerous and the process is commercially attractive under Indian conditions. It is an important tool available to the Indian tanner to make the leather processing more environmentally friendly.

Acknowledgement

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Thermoplastic Elastomers: The Engineering Materials

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PREFACE

Several important industries namely the plastics, rubber, fiber, coating, and adhesive industries, are based on polymeric materials. Although the basic properties of the products of these industries, all depend on the unique characteristics of polymers, for historical, technical and marketing reasons these industries have largely developed separately. Plastics and rubber products are often of a similar physical form; indeed there is no line of demarcation for use of these polymeric materials for plastics, rubber, fiber, adhesives, or coating products. Despite these common factors the rubber and plastics industries have grown up separately and have largely remained separate.

The major difference between rubbers and plastics are related to their mechanical behaviour. Compared to plastics, rubbers are much softer (typically they have a tensile modulus lower by a factor about 10^3) and exhibit much greater elongation from which recovery is usually complete, (that is they exhibit rubber elasticity). A further important difference is the necessity for crosslinking the polymer molecules in rubbers by vulcanisation; a process not required in plastics. This is the main reason for different processing methods for rubbers and plastics. These differences account for the separate development of rubber and plastic industries and of the materials on which they are based.

Perhaps the single most important factor that could bring about the integration of the plastics and rubber industries is the development of a group of materials, called THERMOPLASTIC ELASTOMERS. In addition to their direct technical and economical benefits, these may also benefit the polymer industries indirectly by helping to break down the somewhat artificial barriers that still exist between the rubber and plastics industries.

The term theromplastic elastomers (often abbreviated to TPE) or elastoplastics is used to describe those polymer materials which are elastomeric, in that they demonstrate at least a moderate degree of rubber elasticity, but which can be shaped into useful products by processing techniques intended for thermoplastics without the need for vulcanisation to form chemical cross-links between the polymer molecules. In otherwords TPE's can be described as a class of materials that have elastomeric properties at ambient temperatures, but processes like thermoplastics, obviate the need for the vulcanisation step to develop typical rubber-like elasticity.

The elasticity of rubber derives from the flexibility of the polymer chains, which in turn results from the ease of bond rotation about main chain bonds. This flexibility leads to ready deformation combined with rapid recovery as the stretched molecules revert to their natural randomy coiled state when the deforming force is removed. However, in rubbers for practical technological use, it is necessary to lightly cross-link the polymer chains in order to reduce any permanent change in shape (set or creep) that may occur on stretching, as also increase strength and stiffness and to improve resistance to swelling by contacting liquids, especially oils. In conventional rubbers the cross-links are covalent chemical bonds whose formation requires careful compounding with vulcanisation ingredients followed by heating most frequently in a moulding, to set the shape produced during moulding or other shaping process. In contrast, in the thermoplastics shaping process, no such ingredients are needed and the shape is set simply by cooling the shaped melt to harden, enabling it to harden in a simpler and more economic process.

The cross-links in TPEs are not conventional covalent bonds but are physical cross-links formed when the polymer melt is cooled. TPEs therefore offer the ability to manufacture rubbery products by the more convenient thermoplastic processing methods, saving both compounding and processing costs. The specific advantages that arise from these methods, include shorter cycle times, low die swell, ability to mould to light tolerences, no flash production, no necessity for trimming and, perhaps most importantly the ability to re-use scrap materials. Overall, greater uniformity of product quality is more easily achieved in these continuous processes compared with the batch processes often used with conventional rubbers.

As a family, the thermoplastic elastomers are begining to replace other speciality rubbers in a wide variety of uses. Although most elastomers are vulcanised (cross-linked) in a labour-intensive process, the process can be eliminated by the use of thermoplastic elastomers, which have stiff and flexible domains in the polymer chains and can be moulded without vulcanisation. Thermoplastic elastomers may be styrene copolymers, polyurethane copolymers, melt-processible polymers, chlorinated polyolefin-acrylate blends and polyesters. Since they soften at higher temperatures, they may be injection-molded or extruded, and when cooled recover their physical properties.

The materials are not cross-linked, and scrap can be reprocessed. Their useful temperature range is limited by their softening points. These qualities result from the unique physical network structures obtained in a specific relationship that allows the stiff molecular segments to act as physical cross-links. Thus, a soft segment with a glass transition temperature (Tg) below room temperature is chemically linked to a hard segment having a Tg above room temperature. Variations in physical properties may be obtained by changing the identity of the blocks, their linearity, the degree of polymerisation of the individual blocks, or the ratio of one to another.

When compared to general purpose elastomers such as SBR, natural rubber, and polybutadiene, the thermoplastic elastomers must be classified as speciality elastomers with markets outside of tyres, which consume 60 per cent of world's rubber production. However, the growth rate of the thermoplastic elastomers for the next five years is projected to be higher than those for the more common elastomers. Styrene-diene block copolymers constitute the largest group followed by the thermoplastic polyurethanes and copolyester ethers. The elastomers may be processed by a wide variety of techniques including solution processing, extrusion, calendering, injection molding, blow molding, and vacuum forming. Standard rubber and plastic equipments are useful for processing the elastomers.

ADVANTAGES OF THERMOPLASTIC ELASTOMERS

The main advantages of TPEs over conventional rubbers may be summarised as follows:

(1) Little or no compounding is required
(2) Simpler processing
(3) Shorter processing times
(4) Lower energy consumption
(5) Recyling of scrap
(6) Closer and more economical control of product quality
(7) Lower density and
(8) Use of common plastics processing methods such as blow molding and thermoforming.

TPEs have some practical disadvantges, some of which are enlisted below:

(1) They embrace technology unfamiliar to conventional rubber processors.
(2) They require processing equipment unfamiliar to the thermoset rubber processors
(3) A limited number of low-hardness TPEs are commercially available and
(4) TPEs melt at elevated temperatures, precluding their use in applications requiring even a brief exposure to high temperatures.

TYPES OF THERMOPLASTIC ELASTOMERS

Six generic classes of TPEs are generally considered to exist commercially. They are (in order of increasing cost and performance level) :

(1) Styrene block copolymers
(2) Polyolefinic blends
(3) Elastomeric alloys
(4) Thermoplastic polyurethanes (TPUs)
(5) Thermoplastic copolymers and
(6) Thermoplastic polyamides.

Commercial TPEs cover a hardness range from 30 shore A to 75 shore D, with the number of grades available increasing progressively with hardness. With increasing hardness, the rubber-like properties of TPEs decrease progressively, and the plastic like properties increase. TPEs have useful temperature ranges from as low as -95° F to as high as 340° F, and are capable of extended service in a broad spectrum of environments. Thus they are viable alternatives for uses which heretofore have been the specific province of a thermoset rubber.

ELASTOMERIC ALLOY TPEs

Elastomeric alloy TPEs exhibit a broad range of performance within a single product line; they may be functionally equivalent to a thermoset rubber on one end of the performance spectrum and to a thermoplastic on the other. These TPEs replace rubber essentially because of processing advantages. They eliminate vulcanisation, increase productivity, reduce scrap, and minimise dependence upon compounding. As candidates for rubber markets, TPEs are challenged by such requirements as low hardness, space compliance, deformation under load, and rapid and complete shape recovery. At the opposite end of their performance spectrum, flexible plastic applications call for a different set of properties than those expected from thermoset rubbers. To meet the needs of these applications, the alloys feature rigidity (flex modulus), impact toughness, and tensile strength. They displace flexible plastics in these markets largely by exhibiting superiority in such properties as low temperature flexibility, creep resistance, elastic recovery, and coefficient of friction.

THERMOPLASTIC VULCANISATES (TPVs)

Thermoplastic vulcanisates comprise a rubber/plastics mixture in which the rubber phase is highly vulcanised e.g. combination of ethylene/propylene elastomer or nitrile rubber and polypropylene in which the valcanised rubber is intimately dispersed. These mixtures, dynamically vulcanised and blended, are distinct from simple polymer blends in which the rubber phase is vulcanised, precrosslinked or only partly vulcanised. TPV properties are also enhanced by the manufacturing process in which the completely vulcanised rubber e.g. EPDM is finely dispersed in a matrix of PP as the continuous phase.

Several other combination of vulcanisable rubber, including natural rubber, and crystalline or semi-crystalline thermoplastics, have been reported as examples of such bicomponent systems. The new class of material is a synthetic elastomer that has properties of a true rubber, and a thermoplastic, and which can be processed on both plastic and specially modified rubber equipment. These materials also include alloys of proprietary ethylene interpolymers and chlorinated polyolefins in which the ethylene polymer component has been cross-linked *in situ*. Plasticizers and fillers are incorporated to give flexibility and reinforcement. Injection molding grades have been developed recently to significantly improve flow and injection molding capability.

Properties

Elastomeric alloys are available commercially in hardness ranging from 54 shore A to 50 shore D. Product lines include general purpose extrusion and injection molding grades, as well as flame retardant grades, FDA-regulated grades and medical grades. Ultimate tensile strength varies from 1,100 to 4,000 psi and flexural modulus may be found as low as 800 psi for melt processing rubber to a high of about 40,000 to 50,000 psi for TPV.

Table 1
General Properties of Thermoplastic Elastomers

Type	Hardness Range (Shore)	Sp. Gr. Range
Styrenics	30 A — 90 A	0.91 — 0.94
TPO/TPV	60 A — 75 D	0.91 — 1.1
TPV	70 A — 70 D	1.05 — 1.25
Polyester	35 D — 75 D	1.15 — 1.45
Polyamide	75 A — 65 D	1.10 — 1.15

Generally, the EPDM/PP TPV are known for a comprehensive balance of physical and mechanical properties. They exhibit low specific gravity, broad durometer range, good compression set characteristics for some soft grades, and good heataging. The NBR/PP variations of TPVs appear suitable as replacements for rubber. They have excellent oil and fuel resistance. TPVs of butyl rubber and PP exhibit low permeability to air and water and like MPR, are energy absorbers.

Elastomeric alloys injection mold easily in conventional reciprocating screw machines. They mold in short cycles, release easily and produce well defined parts with good appearance. They can be extruded, blow molded on standard injection or extrusion blow molding equipment, calendered, post-formed and heat welded. These materials also can be formed using chemical and mechanical blowing agents. Modern rubber extruders, certain screw ram rubber calenders can be economically modified to run MPR. Plastic calenders, reciprocating screw injection molding machines and extruders that do not develop excessive shear heat can be easily adopted. A MPR grade with proper flow characteristics can be selected for fabrication by the following techniques: extrusion, injection molding, blow molding, calendering, and thermoforming.

Applications

Most applications realised involve extruded goods like architectural and automotive window seals, hose covers for refrigeration, cable sheathing and electrical sleeving, door gaskets, and latex mandrels. Extrusion-blow molding techniques are also being used to produce convoluted automotive boots from MPR. MPR has its greatest opportunity in producing molded "rubber" products having diverse markets. Examples include molded parts such as crutch tips, sink sealing cable openings, precision o-rings for measuring investments, motorcycle gasoline tank pads to absorb vibrations between frame and tank, molded gaskets for damping and sealing, and automotive wiper blades, brake pedals, window crank and door handle components.

Engineering Thermoplastic Elastomers

The ideal thermoplastic for engineering application will have the following attributes:

* High strength (tensile, compression and flexural)
* High modulus (stiffness, especially flexural)
* Impact resistance
* Fatigue resistance
* Creep resistance
* Heat resistance (to degradationa and softening)
* Chemical stability (including UV)
* Dimensional stability (which implies low water absorption).

In addition, it should be easy to process and have low mould shrinkage. Unfortunately it is difficult to produce a polymer matrix which maximises all of these requirements because the factors which enhance some properties will diminish others. For example, performance at high temperature requires a polymer with a high glass transition temperature (Tg). This has the advantage of improving stiffness and creep resistance, but often with the disadvantages of lowering impact resistance and reducing ease of processing. The level of additives will be ranging from 0.1 per cent to 40 per cent. Additives such as UV stabilisers, anti-oxidants and fire retardants are required with many polymers to enhance their stability in service. Modifications can be considered in three categories:

(1) The addition of fibres (glass) to improve heat resistance, rigidity and creep resistance.

(2) The addition of inorganic particulate fillers to enhance dimensional stability, improve impact resistance and low temperature performance.

(3) Of the 600,000 tonnes of TPEs used in Europe in 1987 9,000 tons were glass-reinforced grades.

Thermoplastic olefins (TPOs)

Thermoplastic olefins (TPOs) continues to grow in auto design. The major thrust is in fascias, mostly at the expense of RIM polyurethanes. The material, however, is still playing catch-up with the European cars, where over 70 per cent of front and rear fascias are made up of rubber-modified polyurethane. In North America, the penetration in 1990 in fascias was about 20 per cent. This compares with a penetration of about 4 per cent in 1990 for air dams, cladding, rub strips, wheel flares, air ducts and interior parts.

TPOs are typically blends of PP, EPDM or EP rubber, PE and a variety of fillers and additives. They can exhibit extremly wide range of physical properties. Flexural moduli can range widely from 2,000 to over 3,00,000 psi. TPOs generally can be processed on most of the conventional plastic processing equipments. Low specific gravity and a wide raw materials supply base gives them excellent cost/performance ratio for consumer and industrial applications. Some new types provide good adhesion to primer, which can be painted to improve gasoline and solvent resistance. TPOs can be formulated to give soft to rubbery to very hard and rigid products. They show high impact strength, excellent chemical resistance, excellent electrical properties and low sp. gravity.

The largest market for TPOs is automotive because of the materials' low cost, low specific gravity (0.9 to 1.1), ease of processing, paintability, and weatherability. It is used for bumper fascias, grillers, air dams, and rub strips. Some non-automotive uses include mud flaps, swim fins, handle grips, wire and cable jacketing, weather stripping, bellows and extruded sheet for thermoforming.

Thermoplastic polyurethane elastomers (TPUs).

Thermoplastic polyurethane elastomers can be characterised by high price and high performance. It exhibits overall toughness and a high degree of flexibility even at low temperatures. They are noted by very high resistance to abrasion and good adhesive properties. TPUs are easily processible and can be blended with a variety of polymers, which can yield a great variety of properties. It finds versatile applications in automotive, wire and cable insulation and films. Current consumptions of TPUs are estimated at 55 million lbs/year.

TPUs have superior adhesive properties, which are suitable for solvent-based or hot-melt adhesives in such applications as running or tennis shoes, where the natural adhesio between upper and lower soles eliminate need for stitching Aliphatic TPUs are highly resistance to UV, but are mor expensive than aromatics. TPUs can be processed by all con ventional means. The material can blended with thermoplas tic rubbers, PVC compounds ABS, Nylon, and SAN. I addition, it lends itself readily to such post-molding opera tions as laminating, hot stamping, heat sealing and adhesiv bonding and may be painted without primers.

Extruded film products of TPUs by both blown and fla die operations are used widely. The films are used for foo packaging. Aromatic ether grades with DIMEG are bein used for hosing and tubing for potable water. Other appli cations include hydraulic hose and tubing for fuel lines, co extruded cable jacketing and profiles such as weatherstrip ping. In conveyer belts it has got large applications. Injec tion molded TPU parts find largest volumes as fende extensions, housings, fascia and gaskets. Automotive body parts can be painted without primer and can be metallised TPUs are being alloyed with other polymers like PVC to improve properties.

THE COMMERCIAL DEVELOPMENTS OF TPEs

In view of the major commercial advantages, it is hardly surprising that the growth in the use of TPEs has been quite dramatic since their introduction and is at present the fastest growth sector among all rubbers. Despite this increasing importance of TPEs, the growth in their usage has just fulfilled initial, though with hindsight perhaps somewhat, optimistic, forecasts made in the early days of TPEs. Several factors have combined to limit the growth, one being the limited resistance of TPEs to elevated temperature and to oils especially in the earlier and cheaper materials. Perhaps the most important reasons has been the reluctance of rubber processors to invest in the new plastics processing machinery required for TPEs. Whilst it is true that the plastics processors could adopt TPEs and indeed have done so quite extensively, a lack of knowledge of rubber product markets by the plastics industry inhibited this development.

The concept of thermoplastic elastomers originated with the commercial introduction of Styrene-Butadiene-Styrene (SBS) triblock copolymers in 1965 by SHELL. Later on, related styrene linear triblock copolymers with improved properties were developed by SHELL, and PHILIPS, to be followed later by other companies. Collectively these materials are known as the styrenics and, in tonnage terms, are the most important group of TPEs.

A different approach to TPE behaviour emerged in 1972 with the introduction of blends of a crystalline olefin plastic (usually polypropylene) with an ethylene-propylene rubber (EPDM). These materials are known collectively as thermoplastic olefin rubbers (TPOs). In the USA, polymer manu-

Table 2
Consumption of Thermoplastic Elastomers

	USA Consumption		West Europe Consumption	
Type	**Tonnes**	**%**	**Tonnes**	**%**
Styrenics	92,000	48	78,000	52
TPO/TPV	62,000	33	27,000	18
TPV	25,000	13	28,000	19
Polyester	11,000	6	9,000	6
	190,000		142,500	

facturers initially marketed these blends but subsequently the business was continued by specialist compounders. In contrast, in Europe, the polymer manufacturers continued to be the main suppliers of TPOs.

The TPOs have a better high temperature performance than the styrenics, but still have poor compression set and oil resistance. More recently the emphasis has been on TPOs in which the rubber becomes extensively vulcanised during compounding with the polypropylene to produce TPOs with much better compression set resistance. These materials are often known as Thermoplastic Vulcanisates (TPVs) and seem likely to replace in large part the older, less satisfactory simple PP/EPDM blends.

The styrenics and TPO/TPV materials may be considered to be the general purpose TPEs. Another group of these TPEs with superior strength, toughness, oil and solvent resistance are often referred to as the engineering TPEs. In general these materials are available only in harder grades and are 2.5 times more expensive. The engineering TPEs are all block, often multi-block, copolymers in which the hard blocks are crystalline, so that melt processing takes place above the crystalline melting point. The first of these materials were the thermoplastic polyurethanes, though subsequently many other companies have marketed their TPVs. Next came the polyester materials followed by the polyamide block copolymers.

Currently total TPE consumption is about 0.5 million tonnes worldwide (about 0.15 million tonnes in Western Europe) representing about 8 per cent of total synthetic rubber consumption. Forecasts suggests that TPE consumption will continue to grow at 5-10 per cent per annum. (compared with about 2 per cent for all rubbers) into the 1990s. The worldwide use of TPE is currently growing at about 9 per cent per year. This growth rate is expected to continue well into the 1990s with TPEs becoming mature products sometimes after the turn of the century and growth rate slowing.

FUTURE TRENDS

Since the introduction of TPEs nearly 25 years ago, their desirable combination of rubbery properties and themoplastics processibility has come to be increasingly appreciated. It is also more readily recognised that despite their higher material cost compared with traditional vulcanised rubbers, final product cost using TPE may be lower because of the more favourable economics of their processing. Some of their earlier deficiencies, such as high compression and tension set and lack of elastic recovery compared with tradtionally vulcanised rubbers, are being overcome in many of the newer materials.

This is the case with the two most important general purpose types — the styrenics and TPOs — where considerable performance improvements have been achieved. Furthermore, the range of high performance, through costlier engineering TPEs continues to widen. These developments in improved materials should ensure sustained healthy growth in the usage of TPEs as they open up new areas of application, especially in the automotive industry.

For over fifty years new thermoplastic elastomer materials have been emerging, many of them as surprises, well before the physical science had advanced paradigms which could explain and predict their properties. To create new thermoplastic elastomers we have at our disposal a very broad choice of polymerisation reactions and catalysts which can be used to enchain the most diverse of monomer, polar and nonpolar, in almost any ratio. All parameters from manufacturing to processing, are at our disposal, permitting us to control and predict processing behaviour and physical properties.

TPE's have been welcome in the market place because they are easy to process and give excellent properties economically. They have quickly filled many product requirements formerly held by conventionally cured rubbers. They have been particularly welcome where the physical properties are adequate and exceptional resistance to the deformation at elevated temperatures, is not needed, for example, in certain wire coatings, shoe soles and adhesives.

We can expect that even with some limitations we shall see the TPEs fill out the entire continum of properties now provided by the conventional cured rubbers. This continum now goes from the softest silicon to the ultrastable perflouro elastomers and includes products with extraordinary chemical and solvent resistance.

In addition, we expect the TPEs to offer properties which can not be achieved with the usual cured rubbers. Certainly they will fill out the territory between the hardest conventional rubbers and the high-impact plastics. This area has been partially occupied already by the so called "engineering" high modulus TPEs such as the polyurethanes and the copolymers. Thus, TPEs will meet the developing needs of the hard, resilient materials more easily and more economically than the cured rubbers.

There are large number of possible structures of new thermoplastic elastomers. The essential principle, now well known, is the requirement of at least two polymeric phases, one fluid (above its Tg) and one solid (below its Tg or Tm) at normal operating temperatures, with some interaction between them. Another area of significant effort will be aimed at chemical, oil, and temperature resistance, with emphasis on the melt-mixing of blends of polymers.

In the triblock copolymeric TPEs, new polymerisation techniques can lead to polyolefinic center blocks with crystalline end blocks. In the next decade we can expect that new thermoplastic elastomers will begin to fill in the entire range of conventional corsslinked rubbers. Undoubtedly there will be limitations, but we can estimate that the utility of TPEs will be much broader than generally considered today.

On Production of Import Substitution Chemicals

N.S. VENKATARAMAN

Around 1,500 chemicals are presently imported into India by various industries. While the import of a number of such chemicals are small in quantity and value, the import of around 200 chemicals are substantial in volume, involving outflow of huge foreign exchange year after year. In the case of such chemicals, there is no indication that organised efforts are being put forth at national level, to create indigenous production capacities with time-bound schedules.

We boast about the reservoir of talented man power of scientists, engineers and technologists in the country. We do not seem to lose any opportunity to claim that the Indian engineers and technologists are much sought after in the developed countries. But, no satisfactory explanation is forthcoming about India's inability to become self-sufficient in the production of goods and services, inspite of such strength of man power. Even after spending significant level of resources and time in research and development, the country continues to import not only chemical products but also the technologies as well in a big way.

Such situation certainly calls for careful study, investigation and analysis. If one were to carefully analyse the various aspects of the number of imported chemicals particularly with regard to the price, quantity and quality factors, one cannot but feel that it should be possible to curtail the import of such chemicals in the near future. While the problems would not be beyond redemption, nevertheless the causes for the problems have to be diagnosed urgently to evolve adequate and proper prescriptions. While a number of chemicals are being imported due to inadequate indigenous production capacities, this is not certainly the case in the case of all the imported chemicals. A number of instances can be readily cited, where the chemicals are being imported, even when indigenous units operate at low capacities due to lack of demand. There are, of course, cases where imports are being carried out due to inadequate product quality of indigenous producers or lack of different grades of products to meet specific requirements of individual consumers. We also find situations, where the same chemicals are both imported and exported; where the country would be the net loser in terms of foreign exchange, since the export price of the chemicals would mostly be lower than the import price.

Even when indigenous product quality would be adequate, the chemicals are sometimes imported inspite of the import duty etc. since the overseas companies often provide credit for long periods of even 6 months from the date of bill of lading for the product. The Advance Licence Scheme of the Government has certainly contributed to such indiscriminate imports, to some extent. As the Government of India is now opening out the Indian economy and appears to feel that the protectionist policy has become counter productive, we are likely to find the dumping of international products into India in greater quantity in the coming months. Since the Indian chemical industries do not appear to be adequately prepared to face such a situation, both structurally and psychologically, it remains to be seen as to what kind of impact it would ultimately leave on the Indian chemical industry. It is very necessary to closely monitor the import of chemicals to assess the trends and performance level of Indian chemical industries, in the coming years.

A number of cases can be readily cited, where the chemicals are being imported without reason, except that such imports would meet the requirements of traders and speculators. The import of products like anatase grade Titanium Di Oxide, Beta Naphthol, 3,4,5 Trimethoxy Benzaldehyde and others are certainly avoidable, since the country has adequate technology and production levels and creation of additional indigenous capacities should be possible in quick time. It is clearly evident that the import of any chemical into the country need not necessarily mean that the product is in short supply in the country or the indigenous production is of inadequate quality.

If the country were to largely avoid the import of chemicals, a very aggressive approach from the Indian chemical project entrepreneurs for the installation and operation of chemical projects is necessary. The present conservative approach of the entrepreneurs towards the decision on plant capacities, research and development targets, design parameters and shop floor management practices have to be given up forthwith. But, as of now, there is no indication that the Indian entrepreneurs are prepared to exhibit such qualities of mind, to face the challenges ahead.

The most serious problem appears to relate to the inability of the Indian entrepreneurs in reposing faith in Indian R&D efforts, for which the R&D institutions in the country are also responsbile, to some extent. The Indian entrepreneurs still look for overseas technologies for even comparatively simple products. There are also a number of cases of repetitive import of technologies for the same products. The technology constraint is a serious problem facing the Indian chemical project promoters. This is amply evident from the fact that several chemical units in the country have become sick in recent times, mainly due to inadequate technologies

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and process methods adopted. The lack of confidence with regard to the indigenous technologies and the problems in acquisition of overseas technologies have often dissuaded the entrepeneurs in putting up large chemical projects to operate in the competitive international markets. The entrepreneurs always appear to prefer to operate in the protected Indian market in a nearly closed system, where the demand and supply at best would only match each other. When the Indian units would only plan small capacity plants to meet the local requirements, the projects cannot afford to have the necessary research & development back up, sophisticated process control system etc. that can contribute to quality and cost optimisation. Such conditions are exploited by the overseas organisations to dump their products in the Indian market at every opportunity.

It appears that the import of chemicals can be prevented in substantial measure only when Indian projects would be of large size, producing products at high quality level. Instead of planning in terms of import substitution chemicals, the Indian units should aim higher and plan for the production of chemicals for the international market. This would effectively change the focus of Indian units and help eliminate the import of chemicals.

Whether it be of import substitution or export orientation, it is becoming increasingly clear that more Government's policies, fiscal measures, concessions etc. can help the Indian chemical units only to a very limited extent. Progressive and dramatic changes can be brought about, only by changed perspectives in the attitude and objectives of the entrepreneurs, higher level of commitment to work by the Indian scientists and technologists and ultimately a sense of pride in the nation and in ourselves.

Quality Improvement and Vendor Development

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In a rapidly changing economic environment, Indian companies will have to look beyond Indian borders and compete against world class companies to survive. Exporting goods and services will play an important role in a company's success in the new environment. To compete against world class companies, Indian companies will need to improve the quality and reliability of their goods and services. Today, manufacturing has become very complex, and most large manufacturers have to depend on vendors to provide raw materials and intermediates. If satisfying the customer is the ultimate goal, then vendor development becomes critical. Vendor quality has become increasingly important because of the following other reasons:

* *Amount of purchased product:* Typically across industries today, raw material and intermediates account for 50-70 per cent of the cost of the final product
* *High costs associated with poor quality of vendor items:* Unreliable poor vendor quality leads to high incoming inspection costs, increased inventory and higher lead times.
* *Interdependence of buyers and vendors:* The "just-in-time" inventory concept aims to receive items from vendors in the right quality and quantity and at the exact time that they are needed for production. In other cases, the buyer may be completely dependent on the knowledge of the vendor in designing and manufacturing the item.

The above reasons provide sufficient evidence of the need for a systematic and structured approach to vendor development.

VENDOR DEVELOPMENT: AN APPROACH

The overall objective of vendor development is to create a relationship with a supplier that assures that the product will meet fitness for use needs with a minimum of incoming inspection or corrective action. The primary activities necessary are:

* Vendor relations quality policy
* Organising for vendor relations
* Evaluating vendor quality
* Vendor selection
* Joint quality planning
* Evaluating delivered product
* Vendor certification
* Improvement of vendor quality
* Vendor quality rating.

Vendor relations quality policy

In the past, a buyer's relationship with vendors was mostly adversarial and at best contractual. What is required today is teamwork based on mutual confidence and joint planning. This shift is necessary because of the need to secure quality improvement from suppliers. To create such a teamwork environment will require some policy changes:

* long term purchase agreements rather than year to year. This will encourage vendors to invest in improvements
* fewer suppliers, thereby increasing the share of market of the survivors. This will provide more time for exchange visits and other forms of technological cooperation.

A good deal of unwritten vendor quality policy exists in the form of long standing industry practices. As interdependence grows, the need for published policy grows with it. The Union of Japanese Scientists and Engineers have evolved ten principles for vendor-buyer relationships. They include:

— mutual respect and cooperation
— prior contractual understanding
— agreed methods of evaluation
— agreed plans of settling disputes
— exchange of essential information
— adequate performance in related functions
— vendor responsbile to deliver products and supporting data
— consumers interest prominent.

Companies must formulate clear vendor relation policy and publish them as part of the company's vendor relation manual.

Organising for vendor relations

The responsibility to assure vendor quality requires close cooperation of the product development, purchase and quality departments of both, the buyer and vendor. It is essential that the essential activities are listed and responsibilities are defined. This will enable multiple paths of communication between the buyer and vendor.

Evaluating supplier quality.

The most common approach used to evaluate vendor quality is using vendor surveys. The Japanese have developed an excellent and innovative approach to evaluate vendor quality through surveys. Vendor surveys as conducted in the West have not proved to be useful in predicting the future quality performance of vendors. The Western emphasis has been on organisation and documentation, whereas the Japanese approach has been on the capability of the process, the adequacy of process controls and training plus qualifications of the work force.

The Japanese, in certain cases where technology is inevitable, have even arranged for finance from financial institutions for the vendors. For example, Toyota Motor Company started the process of evaluating suppliers in early 1989 for its new plant in Derbyshire, UK even though the first car will not come off the line till December 1992. Toyota teams have assessed capabilities according to four key criteria:

— management capability and attitude
— production and manufacturing capabilities, and level of investment in technology
— quality control systems and philosophy
— research and development capability.

As a consequence, the Western approach has tended to concentrate on conformance to procedural specifications rather than on product fitness for use. The emphasis is on the vendor's general plan of approach, not on specific products or processes. It is therefore important that vendor surveys have a balanced emphasis on both quality systems as well as process capability. The capability of the vendor's processes should be assessed and found capable to deliver to the requirements. In addition, vendor surveys should examine the financial soundness, management commitment to quality improvement and the reputation of the vendor.

Vendor selection

The analysis of surveys, aids the process of supplier selection. In addition, information derived from buyers who have previous experience with the vendor on similar products and information from available databases should be obtained. Collectively all these inputs still leave doubts as to what should be the subsequent actual performance of the vendor. Many buying companies respond to these doubts by placing new suppliers in a provisional category until subsequent deliveries remove these doubts.

Supplier selection should also take into consideration price and delivery against schedules. While estimating the cost of purchased goods it is necessary to include added costs due to scrap, rework, delays, field failures and other consequences of poor vendor quality in addition to the price of purchase. These added costs sometimes exceed greatly the savings due to buying from the lowest bidder. The Toyota Motor Company does not blindly accept an offer based on an unusually low bid. Their policy stresses that the vendor should receive a fair price to help maintain a proper quality system and make a fair profit. This helps to develop long term business relationships with their vendors.

Joint planning

The need for joint planning depends mainly on what is being bought. For traditional products the need is limited. However, for modern products the teamwork concept is extremely useful. Companies who engage in joint planning outperform those who do not. During joint planning, the vendor participates in the development of the product in tandem with the designer, offering expertise and knowledge to solve the most difficult of problems. This helps the vendor's understanding of the use of the product, identification of critical parameters and in some capital intensive products sharing of the cost burden.

Various economic considerations are considered in the form of value analysis, trade offs among parameters (cost, quality and delivery) to optimise overall quality costs. A situation develops where the both the purchaser and supplier are helping each other towards the supply of a product that will meet the performance requirements at minimum cost. Joint planning also reduces the product development life cycle and creates multiple paths of communication between the purchaser and vendor. Further, it reduces the need for multiple sourcing and creates long term relationships with vendors.

Evaluating delivered product

It is important to evaluate the product and provide the necessary communication to the vendor especially for new products. The purpose of such communication is to supply essential information, provide performance data, identify troubles which arise and improve the ability of the parties to work together. For important supplier contracts, it is even useful to have personnel residing at the supplier's plant. This enables better communication and can expedite product acceptance and other decision making. As subsequent batches of the item are delivered, the need for evaluation can be reduced from 100 per cent inspection to sampling inspection and finally no inspection once the supplier processes have proved their on going capability.

Vendor certification

Vendor certification is the process of evaluating the performance of a vendor with respect to product quality, with a view to authorise the supplier to self-certify shipments. This occurs after the vendor has provided adequate evidence of consistency in quality of the supplies. After a vendor is certified, the buying company should conduct periodic audits of product delivered.

Improvement of vendor quality

Frequently there have been extensive discussions between the buyer and vendor on chronic quality problems. This is best accomplished with factual information. One approach to convince the vendor is to show the effect of poor quality on supplier costs and sales income. Supplier quality programmes can fail because the vital few problems are not identified and attacked. The buying company should take the lead and provide quality training to the vendor employees as well as participate in joint quality improvement efforts.

Vendor rating

Vendor quality rating is an overall assessement of the supplier quality performance and is used to assist in making decision of the broadest nature, for example, whether or not to continue to do business with a vendor. It is important that such vendor ratings put balanced emphasis on price, quality and delivery of suppliers. Vendor ratings provide an objective way to evaluate suppliers and to determine the share of future purchases given to each vendor.

An Indian example

An Indian company that has successfully developed vendor upgradation into a fine art is Maruti Udyog Ltd. (MUL). MUL is associated with over 400 vendors who supply a variety of components. Of course, the fact that Maruti had to indigenise under its phased manufacturing programme, must have been the motivating factor. Their internal rating system keeps track of vendor performance with respect to the quality, quantity and delivery schedules. This has enabled them to classify the vendors into different categories ranging from good to poor. A review of the various categories of vendors indicated tooling quality, proper raw material supply, process control, quality management system and a total productive management system as the local areas that needed attention. However, in carrying out the specific upgradation exercises, it was found that a case-by-case approach was practical as each vendor had problems that required specific solutions based on the capability of the manufacturing processes. The problems ranged from inadquate training of personnel and poor technology, to lack of process capability. MUL has gone to the extent of requesting financial institutions to come forward with innovative schemes to help vendors upgrade themselves.

Conclusion

From a supplier's viewpoint, an 'A' category customer receives the vital attention of the upper management. Therefore, a small but thoroughly vetted list of approved suppliers is of greater importance to a buyer than a much longer list of unknown suppliers. The latter can only hike the cost of inspection. This very important function is usually performed by the purchase manager, who has to constantly identify cheaper and alternative sources of new items. To establish confidence in the supplier, it would sometimes be necessary to work, in conjunction with the quality assurance people.

However, this joint planning is not oblivious of the economics of the supplier. And the product supplied is, more often than not, cheaper than what could be purchased from another vendor. This is because the gains from higher quality are usually shared between buyer and vendor. Also, it is entirely feasible for the vendor to be an adversary on prices and a member of this team on quality. The initial investment incurred by the buyer is usually recovered very soon through higher quality and lower costs. Clearly, the benefits accruing from vendor development are so great that manufacturers can only ignore this issue at their peril.

"Feel" Your Chemical and Pharmaceutical Market and Manage Your Sales

AHMED M. ROWJEE

Introduction

India is a free and democratic country where entrepreneurs function both in the public as well as in the private sector. As the government acts as a welfare state, it discourages monopoly and encourages competition for selling any product. Hence it is necessary to have a "feel" of the market about customer's requirement of your product so that you can sell your product with enthusiasm. To get a "feel" of the market and meeting the requirement of many customers in various territories, it is necessary to adopt a proper marketing strategy before selling your product. The present article highlights market research, test marketing and action planning towards sales which are good marketing strategies to boost sales of your products.

Data from secondary sources

The basic purpose of conducting market research for a new product or for a new market of an existing product is to focus and organise timely marketing information so as to reduce risks, spot problems and potential problems in the current market, identify the quality of the product and what people feel about the product and the company that manufactures that product. Information regarding credit facilities and discount the manufacturer offers to the dealers and other facts about the market such as price for different specifications of a product etc., which will help the entrepreneur to make a better decision to set up an effective action plan, can also be gauged from an appropriate market research.

Before framing questionnaires for conducting market research surveys, it is necessary to collect data from all secondary sources. These include: installed capacity and production data from DGTD Annual Reports, publications from the Stock Exchanges; sales data from profit and loss account of limited companies; specifications of the product from trade associations, Indian Standard Institute, newspapers, encyclopedias etc., export and import statistics from publications such as the monthly statistics of foreign trade of India and daily custom lists of various ports, particularly Bombay, Cochin and Madras; information on prices from newspapers and associations; industrial licence and letters of intent issued by the government from Indian Investment Centre and all other relevant information.

Data from primary sources

After collecting data from all the above secondary sources, it is necessary to frame questionnaire for dealers, end-users and manufacturer incorporating the product specifications obtained from various books. Here questions are asked to obtain all informations which cannot be obtained from secondary sources like the customer's present requirement of the product specificationwise, what they feel about the quality and the availability of the product, the price customer would prefer alongwith credit facilities, the future demand and growth rate for the product and so on.

The basic purpose of framing marketing questionnaire is to find how the product will benefit the customers and not to evaluate technological intricacies. This is so because the dealers and end-users are interested in selling benefits but not sophisticated technology. The intricacies of cold manufacturing process and boiling point, vapour pressure, specific heat etc. plays no part at all in conducting market research or in buying motives. Also incorporating correct specifications in the market research questionnaire and sales negotiation is essential as under section 29 of the Indian Contract Act an agreement whose meaning is not certain or capable of being made certain is void. For example let us say Mr. A agrees to sell to Mr. B a hundred tons of edible oil. Now this contract is not valid as there is nothing in the contract whatever to show what kind of oil and of which specification whether solvent or expeller variety Mr. A intended to sell. This agreement is therefore void on the ground of uncertainty.

Test marketing

In most products it becomes necessary to test the market. For both new and established products, test marketing in a limited geographical area before going national is an effective way to examine the performance of market variables. It is useful in determining the norm of consumption and pricing strategy. The results of test marketing can show the quality of the product and to what extent a new product will bring additional sales. Marketing tests enable a company to anticipate competitive response.

Test marketing is useful to find out whether customers will repurchase a product once they have tried it, why they will do so and how the product should be positioned to achieve maximum sales. At this stage analysis of questions like "Does it have the right price and packaging, is it aimed at the right market segment, what is the best distribution strategy" are useful in determining the difference between success and failure of your product. In practice, test marketing produces good results in high volume low cost products like pharmaceuticals and chemical products than in those products whose purchase cycles are long.

Demand for the product

Assessing demand for the product is an important consideration for framing questionnaires during primary stage and for test marketing. Although in most chemical and pharmaceutical products, demand can be ascertained by actually contacting the customers, in consumer food products it is not possible to contact each and every consumer, as customers are far and wide even in households.

In such circumstances linear regression method based on population per capita income and apparent consumption (meaning production + import-export) can be used. However even in consumer food products the opinion of agents, subagents, brokers etc. is necessary in order to evaluate the demand pattern, the government policies and so on. After assessing demand, it is necessary to plan and organise sales territory. This requires effective organisation system and action planning for managing sales.

Action planning towards sales

After doing a thorough study about the customers demand etc., it becomes necessary to manage your sales territory. In managing your sales territory, as you have to cater to large as well as small customers, you have to make ABC analysis of your customers. Just as likes and desires of customers are different, so also are their requirements. It is then appropriate to review the call or the market research survey you made recently. This can be done by maintaining and updating customer record card. The objective of preparing customer record card is to give a ready reference of each of your customer's accounts. This is a controlling function. A customer record card enables you to know what is happening in your territory and what progress you are making towards your objectives.

In addition to marketing information, the customer record card can include personalisation techniques which are necessary ingredients to boost sales and develop healthy long term relationship with your customers. This personalisation technique would consist of such vital information of each customer like preference for certain hobbies, clubs etc., birthdays, the number of children he has, the birthday and likings of each of his children and so on. In practise, in most cases in-person sales call may be necessary. This requires careful analysis and should be aimed at maximising the time spent with key customers and minimising travel and waiting time.

A good way to start developing your own marketing plan is to review the call or the market research survey you made during the last few days. From this you can find out the customer's conditions of delivery, after how many days the customer will have to replenish his stocks, whether the customer would be a prospective client for large orders or not and so on. Then a perfect checklist of what the sales people should be doing before and during a sales call should be planned. An ideal checklist for a perfect sales call before meeting customers would be as under:

(a) Consult the company data bank to determine how the market place perceives your product or service.
(b) Discuss the idea about how you can anticipate potential objections and plan your closing techniques with your colleagues or sales manager or owner manager.
(c) Study the Annual Report of the customer's companies and learn the buying policies of the customer's companies.
(d) Study whether the client is new to your company. Your best prospects are people who have just come on board or who have gone in for expansion plans.
(e) Know and learn the name of the customer's secretary and the name of the person who has the authority to make a decision for buying your product.
(f) If there is more than one buyer, then know in advance who will be attending and reconfirming the meeting by phone the day before.

A checklist for perfect sales calls during sales meeting would be as follows:

(a) Smile and call the secretary by his or her first name. Here if you have doubts about pronounciation, confirm whether you are correctly pronouncing his or her surname or not.
(b) Introduce yourself with the customer's secretary by speaking directly about the purpose of your call.
(c) While conversing be humble. Ask questions about what they want to buy. When you ask a question "How's your business going", you should not answer yourself that the economy is bad.
(d) While conversing, do not ignore the quiet one in the corner and play up only to the boss.
(e) Find a personal issue that you have in common with the client such as hobbies, sports, hotels and clubs etc. to "humanise" the discussion. In business it is important that the customers should like you and trust you before they buy.
(f) Make sure that the purchaser in the meeting knows your background and service. Therefore you should begin with a two to three minutes overview and then allow him to talk.
(g) You should not give any impression that you only do "big" deals.
(h) Listen attentively to your customers and observe aggressively the body language such as eye contact.
(i) After listening to the customer, do not blurt out a response. Take a minute to consider the timing and whether you can use it to your advantage.
(j) Whenever possible include one of your successful case histories or involvement by someone else in their indus-

try by saying "Oh I remember, when we were with our other client Mr. XYZ, they had a similar problem and we suggested ......".

(k) Be prepared to switch your sales pitch to some other concept or service.

(l) Be sincere. If you do not know something such as a date, a price, a name etc. say so. Then you should go to them with a right answer a day after.

(m) In pricing your proposal, there is no harm in thinking in terms of good service and cash.

Thus once you have developed your organisation system for organising yourself and your sales territory, you must give it a fair trial before discarding it and claiming that it will not work. Your system should not only take into account the type of business you are in and the way your customers want to do business, but also how you can sell more effectively at lesser costs. No matter what plans you develop, there obviously will be future modifications. There will be corporate accountability in sales which will require analysis of questions like what went wrong, why it went wrong and what steps should be taken to rectify the mistake. It is for this reason your plan should be reviewed carefully. The checklist for reviewing plan for each call and for corporate accountability would consist of:

(a) do you ascertain the customer's present and future requirements as to specifications?

(b) do you maintain strict quality control of your product?

(c) do you maintain a strict delivery schedule?

(d) do you price your product competitively with imported product?

(e) do you listen to the customers regarding complaints, suggestions etc. and do you act on their complaints or suggestions or simply bypass them?

(f) do you inform customers about the new R & D facilities adopted by your manufacturers which will benefit customers?

(g) do you know what was accomplished during the last call and what growth rate is expected in the next one year?

(h) do you know what promotion or sample or specification sheets should be taken with you on your future calls?

(i) Have you decided what new features of your product will be explained?

(j) have you noted the key contacts as a result of change of directors, amalgamation etc. in your customer's accounts? Which new person will now influence the buying decision?

(k) have you reviewed your personalisation techniques with the new buying decision makers?

(l) are you constantly updating your information system in the customers record card and your manual to keep track with latest changes in the market, technology, government legislation and control and so on?

Conclusion

No economic development of any country can take place without boosting its products. For unless there is profitable and effective sales, there is nothing to manage and hence nothing to forecast for an ideal future.

The most effective way to boost sales of your product is to know your product, know the present and future requirement of your customers, know how the manufacturer wants to position himself in the market place and finally doing effective action planning to sell your product with enthusiasm. This knowledge of the product, manufacturer and the customers requires a "feel" of the market to manage and influence the customers in your territory.

News from Abroad

HOECHST DECLINES BY 26 pc

Hoechst has continued the tale of woe from the German chemical companies by announcing a 26 per cent decline in pre-tax profits to DM605m ($367m) in the first quarter of 1992.

Nor did the company see early improvement in activity. Hoechst said it hoped for a more favourable trend in operating profits in the course of this year although no significant revival in business had been seen so far in the second quarter.

Th first-quarter profit represented a yield turnover of 5.3 per cent against 7.3 per cent in the same period last year. In the whole of 1991, pre-tax profits dropped 20 per cent to DM2.6bn, with turnover 5 per cent higher at DM47bn. The company cut its dividend by DM1 to DM12.

Hoechst said demand had picked up considerably in the first three months compared with last year's fourth quarter, but was still weaker than the normal seasonal level. There were few signs of economic upturn either in western Europe or the US, with growth slowing in Germany and Japan.

Group turnover in the quarter was two per cent higher at DM11.5bn. Volume sales were two per cent higher, but prices fell at the same rate under the weight of heavy competition. The higher value of the dollar and yen against D-Mark accounted for the slight turnover advance. In Germany, turnover was also up by two per cent; business in industrial chemicals was weak.

Hoechst's comments about the slackness of foreign markets were in line with those of Siemens, the German electrical and electronics group, which reported an eight per cent rise in first-half net profits, mainly because of domestic growth. Siemens reported flat foreign business and benefited from orders linked to economic reconstruction in East Germany. Chemical companies have little involvement with East Germany's infrastructural rebuilding.

Hoechst said that its exports were weaker, although sales of dyes to the US and pharmaceuticals to Asia were higher. EC business was stagnant. The 12 per cent turnover rise in the US was due to the first-time inclusion of Great Lakes Carbon, the US graphite subsidiary and the firmer dollar.

MITSUBISHI KASEI AND ASPENTECH ESTABLISH GLOBAL TECHNOLOGY PARTNERSHIP

On the occasion of AspenTech's Third User Group Meeting in Kyoto, Mitsubishi Kasei Corporation (MKC) and Aspen Technology, Inc., (AT) announced that they have entered into a comprehensive long-term global technology partnership agreement. This agreement gives MKC complete access to AspenTech products, including ASPEN PLUS™, the industry-leading process modeling and simulation system. The two companies are also working closely together to apply AspenTech products to certain high-value applications, including suspension PVC.

"We have achieved very significant savings at our Acrylonitrile plant, VCM plant, and ethylene plant through the use of ASPEN PLUS," stated **Mr. Yoshihisa Shoda,** Deputy General Manager at MKC's Mizushima Complex. "These savings, derived from both increased throughput and lower operating costs, have driven us to make AspenTech products and engineering standard at MKC".

"MKC is now one of the most successful users of process modeling technology in the world", commented **Mr. Kenneth P. Morse,** an AspenTech Director. "They have been a leader in bringing advanced technology to Japan and in agressively applying that technology to raise the overall productivity of their engineers. Their commitment to continued innovation makes MKC an exciting place to work".

"We have chosen to work with AspenTech because their technology is superior to all other simulators we have tried. We have been especially impressed with ASPEN PLUS's ability not only to model simple processes but also to handle highly non-ideal conditions which no other simulator could accurately model", stated Mr. Shoda. "We intend for every MKC engineer in production, engineering and R & D to use AspenTech products".

Mr. Satoshi Ogura, General Manager of Technology System Department explained some of the benefits of becoming AspenTech's long-term technology partner.

"The arrangement facilitates our technology planning and gives us 'preferred customer status' including":
* Access to new technologies before they are made generally available
* Flexibility to change our computer hardware at any time
* Additional copies of the software for use worldwide
* Frequent visits and advanced training by AT's most knowledgeable experts
* Special consideration of our needs in AspenTech's development programmes.

"We believe this partnership is a necessary step for MKC to acheive their goal of becoming one of the world's ten largest chemical companies by the year 2000", said **Mr. Hiroaki Suzuki,** Representative Director of AspenTech Japan Co., Ltd.

ASPEN PLUS was first introduced into MKC in 1987 and used on a number of processes in Mizushima, Kurosaki, and Yokkaichi. The company has subsequently successfully introduced other AspenTech computer-aided

engineering tools, including:

BATCHFRAC™, a system for modeling batch distillation columns;
RATEFRAC™, a new rate-based system for modeling distillation;
PROPERTIES PLUS™, AspenTech's physical properties system.

MKC engineers use ASPEN PLUS both to design new processes and to improve the performance of existing operations. An ASPEN PLUS flowsheet predicts the performance of a process by computing the flow and properties of streams, the performance of every unit in the process, and the plant capital and operating costs. Engineers use simulation to quickly and systematically analyze viable operating and design alternatives and to choose the one which can best enhance results.

AspenTech is a privately held company with its world headquarters in Cambridge, Massachusetts, U.S.A. It was founded in 1981 next to the campus of the Massachusetts Institute of Technology to enable engineers to make better engineering and business decisions through the use of computer-aided engineering tools. More than 300 companies, including nine out of the world's ten largest chemical companies, use AspenTech products. In Japan, AspenTech products are used by more than 20 of the leading process industries companies. AspenTech's recent acquisition of Prosys Technology Limited of Cambridge, UK, makes AspenTech the world's largest supplier of process modeling technology.

OZONE LAYER INCREASINGLY VULNERABLE TO CHEMICALS

While early warming over the Arctic prevented major ozone loss this winter, results of a seven month U.S. study confirms that the ozone shield protecting the Earth's Northern Hemisphere is "increasingly vulnerable to depletion by man-made chemicals". The magnitude of ozone loss over the Arctic region depends on the severity and length of the Polar winter, according to Harvard University Professor **James Anderson**, who headed the National Aeronautics and Space Administration (NASA) study. Cold temperatures in December and early January primed the Arctic region chemically for considerable ozone loss, but early warming of the region in late January prevented a major depletion which had been predicted by NASA on the basis of preliminary findings early in February.

It also found evidence that ozone thinning at mid-latitudes in the Northern Hemisphere is related to increased levels of chlorine and bromine in the stratosphere. The study confirms many of the initial findings announced by NASA in February. At that time, the space agency said tests taken in the Northern Hemisphere's Stratosphere over three months showed extremely high levels of the most potent ozone-destroying chemicals, particularly Chlorine Monoxide (CLO).

Those tests suggested that an "Ozone Hole", similar to one tracked over the Antarctic area since the mid-1980s, was likely to open up in late winter and early spring over vast areas of Canada, Russia, Northern Europe, and parts of the United States.

Such a hole would have exposed the Earth's surface to the sun's dangerous ultraviolet radiation, substantially increasing the incidence of skin cancer and cataracts in humans and stunting the growth of many plants, including some food crops.

NASA's February findings were so striking that, one week after their release, U.S. President **Mr. George Bush** announced a dramatic speed-up in the time table for phasing out major ozone-destroying chemical emissions, the most notorious of which are chlorofluorocarbons (CFCs).

EC CONCERN OVER BAN ON BIO-TECH RESEARCH

To do or not to do is the dilemma of the European Parliament on the question of bio-technological research within the community. Members are horrified to contemplate the future possibilities arising from the deliberate release into the environment of genetically modified organisms from recombinant DNA technologies.

At the same time they are wary of a blanket ban on all bio-technological research that could give an edge to the US or Japan leaving Europe behind. According to **Enrico Falqui,** who chaired a recent committee on biotechnological research, there is a middle ground. "Concerted action should be undertaken to ensure that necessary consideration is given to the ethical and social effects of these projects and their application in agriculture, industry, health care and environment. Such action must ensure that information is made available to the public concerning each programme".

The European Community recognises that bio-technology is a "new and sensitive subject" of research which could lead to improved agricultural efficiency and viability and improved quality products for the consumer. At the same time however, it underlines the right to genetic identity as "part of the integrity and dignity of human beings. As part of the fundamental rights for which respect is guaranteed".

Bio-technological research aims at two goals to understand and control biological functions carried out by proteins (enzymes, hormones, antibodies, receptors, body structures, etc) and to produce potentially useful proteins (new drugs, industrial enzymes etc) which can be used as a basic intermediate projects. "The goal is to arrive at a greater understanding of biological and genetic mechanisms," says Mr. Falqui but is worried about the ethical implications of such research. Placing caution above all other considerations, the Parliament has given reluctant approval to comparative bio-technological studies of reproductive events, however, it forbids research on human embryos. Despite the caution the Community is worried about the impact of the introduction of genetically modified micro-organisms on leaf surfaces, soils and ecosystems and has called for a systematic assessment of the residual genetic variability of agricultural and industrial species of all kinds.

The Parliament had decreed that particularly in the case of microorganisms the systematic analysis of possible adverse effects will be carried out taking into consideration the need for a comprehensive understanding of the ecosystems involved.

The research is conditional on the assurance that it will be conducted only at the level of simulations and under laboratory conditions.

There is a reason for caution. According to Mr. Falqui for years innovative bio-technologies, including genetic and cellular engineering, have been promising a technological revolution but have so far not produced the predicted benefits and innovations. "The most recent estimates show that it will be a long time before they have a significant impact on market nevertheless, bio-technologies are still considered a strategic sector, mainly because of their potential for penetrating practically all areas of production connected with living matter-ranging from agriculture to medicine, from the chemical industry to stock-farming". He says, "the objectives of our programme are to meet new market demands, increase energy conservation, produce environmental benefits and reduce the use of pesticides and other chemicals while respecting ethical and behavioural standards'.

News from Japan

NIPPON SOKUBAI, DEGUSSA TO START CATALYST VENTURES IN JAPAN, U.S.

Nippon Shokubai Co. and Germany's Degussa AG have agreed to set up two joint ventures — one each in Japan and the United States — to manufacture and market catalysts for automobile converters. The new ventures will employ the two parent firms' technology.

The U.S. venture — owned 51% by Degussa's U.S. subsidiary and the remaining 49% by Nippon Shokubai —will be located in New Jersey and will install in Kentucky a production line for auto-exhaust catalysts with start-up slated for next spring; the production capacity concerned is put at 2.8 million pieces a year.

The products will be supplied to Japanese car makers operating in the States and U.S. diesel-engine makers. They are expected to meet tighter U.S. car-exhaust regulations that will take effect in 1994.

The Japanese venture — owned 51% by the Japanese company and 49% by its Germany counterpart — is scheduled to market those produced at Nippon Shokubai's Himaji factory. The two parent firms aim to boost the new ventures combined sales to Yen 13 billion ($98 million) some time in the future.

The Japanese-German venture will rank fifth in the world auto-catalyst business, following Johnson Matthey (UK) and Engelhard (U.S.), etc.

SHODEN CONTRACTS TO IMPORT HEAVY NGL FROM NEW ZEALAND

Showa Denko K.K. (Shoden) has concluded a long-term import contract with heavy natural gas liquid (NGL) with Petrocorp Exploitation Ltd. (New Zealand). A total of 180,000 t/y of the product will be imported and the first lot arrived recently.

This move is intended to diversify the Japanese company's feedstock sources and enhance its competitiveness in ethylene business. The company has to date employed propane, butane and heavy NGL as ethylene feedstock.

Heavy NGL is exempted from petroleum tax from this April, so the company intends to step up heavy NGL imports. It imported last year 115,000 tonnes of condensate (heavy NGL) from Australia. The company's ethylene plant is capable of receiving a total of up to 400,000 t/y of heavy NGL.

Shoden has hitherto needed to ensure a steady supply of heavy NGL since it could not contract to import butane from Saudi Arabia. It plans to secure heavy NGL supplies on the spot-deal market, taking into account market prices for naphtha and butane. Mitsui Petrochemical Industries, Ltd., previously concluded a long-term import contract for 200,000 t/y of heavy NGL with an Australian firm.

JAPAN COMPLAINTS OF ROK'S PRODUCT PATENT SYSTEM

Japan's Ministry of International Trade and Industry (MITI) intends to call on the S. Korean government to end the discrimination against Japanese industries as regards application of S. Korea's product patent system, in force since January, 1987.

The S. Korean and U.S. governments agreed in July, 1986 on protection of U.S. product patents, which were pending and established before the introduction of the said system. Japan together with EC, claimed that it was unfair for the United States to be treated exceptionally by the S. Korean government.

The S. Korean government reexamined application of the product patent system to EC member countries last fall, so Japan is now the only developed country which has been discriminated against under the S. Korean patent system.

Japan's pharmaceutical industry is afraid that it may suffer serious damage if its S. Korean counterpart commercializes drugs — equivalent to those patented in Japan after January, 1980 —using manufacturing processes different from those employed in Japan. China has also decided to give preferential treatment to the U.S., as regards establishment of her own product patent system, slated for next January.

BAYER GROUP IN JAPAN ATTAINS RECORD PROFITS IN 1991

The Bayer group in Japan chalked up in 1991 record after-tax profits of Yen 9.9 billion ($74 million), up sharply by 43.8% over the preceding year, despite the sweeping economic downturn in Japan. This stemmed from the excellent sales of the drug division and successful efforts for cost reduction and reform.

The group's consolidated sales in the year stood at Yen 219.5 billion ($1.65 billion), up 1.7% over the year-before level. The breakdown of the group's combined sales is 46% for therapeutic and related products including clinical reagents; 20% for industrial products such as polyurethane, paint materials, speciality metals and pigments; 13% for agrochemicals; and 10% for organic chemicals.

Among the group companies, Bayer Yakuhin Ltd. enjoyed record sales for the seventh straight year, reaching Yen 91.2 billion ($686 million), up 7.8% over the preceding year. It remained the top foreign-capital drug firm in Japan, with its after-tax profits scoring a gain of as much as 52.4% at Yen 8.4 billion ($63 million).

The Bayer group in Japan intends to continue heavy investment to maintain development. It plans to invest Yen 20 billion ($150 million) for construction of a drug research laboratory in the Kansai district with the 1st phase project to be completed in 1994.

Nihon Bayer Agrochem K.K. chalked up sales of Yen 27 billion($203 million) up 2%. Sumitomo Bayer Urethane Co. recorded sales Yen 30.5 billion ($229 million), down 5.1%, with after-tax profits sharply dropping by 20.5% to Yen 644 million ($4.84 million), reflecting slugging car sales here.

Agfa-Gavaert Japan Ltd. registered sales of Yen 12.1 billion ($91 million), up 3.2%, with after-tax profits climbing as much as 121% to Yen 190 million ($1.43 million). Miles-Sankyo Co. engaged in clinical-reagent business recorded sales of Yen 10.5 bilion ($79 million), a level similar to the receding year's, but saw its profits drop 8.5% to Yen 888 million ($6.68 million).

PVC FILM MAKERS TO WITHDRAW FROM AGRICULTURAL-USE ITEMS

Bando Chemical Industries Ltd. has retreated from business in commodity-type PVC sheets and films for agricultural use. The firm completely gave up production of such products as of the end of March, capping its history of over 40 years in this field.

Bando will henceforth boost efforts to push operations for speciality PVC products such as masking films as well as artificial furs. The firm had been curtailing its agricultural-use PVC films and sheets from a few years back in view of poor business results and bad future prospects.

Bando began producing in 1950 PVC products including PVC films for agricultural use. It is one of pioneers in this field but in recent years, increasing competition slashed its market share to only 2% of the total now estimated to be about Yen 40 billion ($300 million).

The domestic market itself for agricultural-use PVC products has been rising steadily, reflecting the shift among farmers to fruits and vegetables stimulated by the government's rice-acreage reduction policy. But intensifying competition among manufacturers and diversifying needs among farmers make it difficult for manufacturers to survive the race.

NEW ETHYLENE PLANT WILL NOT WORSEN MARKET CONDITIONS

Mitsubishi Petrochemical Co. is scheduled to start early in May feeding raw-material oil into a new 300,000 t/y ethylene plant completed at its Kashima factory at the end of March. This was recently announced by President M. Yoshida at a press interview held in Tokyo.

The Japanese petrochemical industry is hurting from poor business resulting from declines in market prices. The company has expanded this month its ethylene production cutback from 8 to 10% and is endeavouring to reduce stocks for ethylene derivatives.

Commenting on the ongoing production curtailment and the planned start-up of the new plant, he says: "Inauguration of the new plant will not adversely affect the market trend because we will switch from imports of 100,000 t/y of ethylene to in-house production by the new plant, supply 100,000 t/y of the product to our group firm, Mitsubishi Kasei, and adjust operation of our outdated production facilities in a bid to offset any possible production expansion caused by the new plant."

"We'll adjust ethylene production to actual demand. I believe the government-set business-stimulation measures will bear fruit within the year and the supply-and-demand situation will thereby be improved," he adds. The new plant will be put into commercial operation this October together with related plants for benzene (150,000 t/y), LLDPE/HDPE (80,000 t/y), polypropylene (80,000 t/y) and ethylene oxide/ethylene glycol (180,000 t/y).

ASAHI CHEM. TO CUT 20% OF STYRENE MONOMER PRODUCTION

Asahi Chemical Industry Co. has decided to mothfall its Kawasaki factory styrene monomer (SM) plant (80,000 t/y capacity) for 6 months as of the beginning of April. This is to cope with the slack domestic market, caused by decreased demand of polystyrene, the major outlet of SM.

The cutback means that Asahi Chemical, one of Japan's top-two SM makers, has slashed SM production by about 20%. Mitsubishi Petrochemical Co., another major SM maker, has already halted operations at its Yokaichi factory SM plant (100,000 t/y capacity) for 3 months from the beginning of March. The firm is now said to have decided on another 3 month stoppage of the plant. 100,000 t/y is equivalent to about 20% of Mitsubishi's total SM capacity. It is believed that the substantial cutback of the "big 2" SM makers will help to swiftly tighten the easing SM market in Japan.

CAUSTIC SODA DEMAND IN FY92 SEEN REMAINING AT FY91 LEVEL

Demand for caustic soda in fiscal 1992 is estimated at 3,610,000 tonnes (up 0.2% over previous year) and that for chlorine, about 4,100,000 tonnes (down 0.4%). Caustic soda exports will continue to decrease, falling sharply (by 10.2%) to 265,000 tonnes.

Regarding details of domestic demand for caustic soda, although caustic soda for chemical fibres and dyeing uses will decrease slightly, that for

soaps/detergents and oil-refinery uses will increase.

Domestic demand for chlorine for paper/pulp use will continue to show a double-digit decrease and chlorine-based solvents will decrease by more than 6%. These decreases will offset steady increases in chlorine for propylene oxide and TDI/MDI — raw material for urethane. As a result, combined domestic demand for chlorine will continue to decrease. Caustic soda production this fiscal year is estimated at 3,859,000 tonnes (down 0.5%) and exports at 265,000 tonnes (down 10.2%).

PY91 AGROCHEMICAL EXPORTS BELOW YEN 70,000 MILLION LEVEL

According to Society of Agricultural Chemical Industry (Japan), agrochemical exports in the 1991 pesticide year (October 1990-September 1991) decreased by 4% from the previous year to Yen 68,826 million due to the chaotic state of East European economies, the Gulf war and the yens upsurge against the US dollar.

In the previous pesticide year 6.2% growth was seem and production topped the Yen 70,000 million level but PY91 agrochemical exports were less than the Yen 70,000 million level, as stated above. Taking into account the exchange rate factor, however, the exports were on par or a little higher than the previous year's level. Exports to North and Central American and West Europe were comparatively favourable.

The increase in exports to Europe and America is attributed to the fact that Japanese manufacturers have put emphasise on exports of upland herbicides and miticides for fruit trees, for which they have obtained registration approved from foreign authorities. Sales attained by Sumitomo Chemical Co., ranking first, seem to be less than Yen 20,000 million level due to a decrease in exports to East Europe.

Agrochemical exports have remained favourable over the last several years despite the low growth of the domestic market. In 1989 they showed a marked increase of 13.6% due to a grasshopper outbreak in Africa and a resultant increase in spot deals of the products. In 1990, supported by an increase in exports to North America and Europe, they recorded 6.2% growth, as previously mentioned.

ALUMINIUM BORATE WHISKER CAPACITY TO BE EXPANDED

Shikoku Chemicals Corporation has begun constructing a large-sized test and manufacturing plant for aluminium borate whisker used as a reinforcing material for FRP and FRM. Shikoku is the first company in the world to synthesize such material and make its commercial application viable.

The whisker, when combined with plastics, metals or ceramics, can substantially increase the strength and rigidity of the mixture, improve the smoothness of its surface, reduce the coefficient of thermal expansion and make colour application easier.

The new 120-t/y plant costing about Yen 700 million ($5.3 million) is to be completed in September and will produce various grades of such whisker, including those specifically for FRP (fibre-reinforced plastics) and FRM (fibre-reinforced metals). The plant will also be operated for R&D on the new material with a view to realizing better production systems, improvement of production efficiency and product quality as well as cost reduction.

Using a 20-t/y plant, the firm has been delivering samples of the product to users since 1989 and has so far received more than 800 enquiries, of which 10 have led to adoption. In addition, several ten companies have reportedly been carrying out evaluation tests on it, the company says.

DEMAND FOR PAINTS WILL REMAIN SLUGGISH IN FY92

Japan Paint Makers' Association recently issued a report on paint-demand estimates. According to the report, domestic Japanese demand for paint in FY92 is estimated at 2,090,000 tons, equivalent to the FY 91 result, which is expected to be $4 lower than in the previous fiscal year.

Behind the conservative estimate is the forecast that the automobile and construction industries, the largest paint users, will take longer to revive due to deteriorating economic conditions at home and abroad. The Japanese paint industry continued to enjoy high growth until FY90. It seems, however, that the time when the industry will be able to get out of its current sluggishness is still far in the future.

The industry in FY90 recorded production of 2,197,607 tons (up 4% over preceding year) and deliveries of 2,176,933 tons (up 4%). In FY91 sluggishness set in and in the first half (April-September) production recorded 1,073,161 tons (down 4%). In FY92 construction-use paints, which account for about 30% of total paint demand, will drop 2% from the FY91 figure and new car-use paints, which account for about 15%, will fall 1%.

UNITIKA TO DOUBLE ARAMID FIBRE CAPACITY TO 1,000 T/Y

Unitika Ltd. has decided to double capacity for its "Apeil" meta-aramid fibre from 500 to 1,000 t/y at its Okazaki fctory (Aichi Prefecture). The expansion plan was earlier scheduled to start last year. Construction on an additional plant worth about Yen 5 billion ($38 million) is set to start by September. With the expansion, the Japanese firm intends to catch up with Du Pont, the world's leading supplier of

aramid fibre and its products, especially insulating paper utilizing aramid fibre. Apeil has high levels of heat resistance and flame proofing: it withstands a temperature of 250°C for over 1,000 hours without a decrease in strength. It has been used for heat resistant filters, a variety of flame-proof apparel and ironing broads.

The aramid fibre also has a good insulation property and expectation is thus placed on its use as a binder of various inorganic fibres for insulating paper. Unitika has already developed, together with paper makers, synthetic paper acting as an insulatory, by combining the fibre with glass fibre, carbon fibre and/or mica. The firm has begun marketing it in Japan. The company is now eager to make inroads into the worked markets for aramid-fibre based insulating paper which have been dominated by Du Pont.

RESIN COMPOUNDING CAPACITY TO BE EXPANDED IN THAILAND

Dainichi Color (Thailand) Ltd., owned 65% by Dainichiseika Color & Chemicals Mfg. Co., plans to expand compound capacity for synthetic resins (12,000 t/y) by 20-30% with completion slated for this August. Japanese manufacturers of household electrical appliances and OA equipment have aggresiveiy advanced into South Asian countries, Thailand in particular, thereby boosting demand for synthetic-resin compounds in the area.

Dainichi Color's business has been put on a paying basis only a year and a half after its inauguration. The company is operating its compounding facilities at a high rate. Dainichseika has been intent on building up resin-compounding operations overseas and has mapped out a plan for building a new plant in Shenzhen, China in response to the entry of the above mentioned Japanese manufacturers into the Chinese City and its neighbourhood. The Japanese company has to date supplied compounds there via its production base in Hong Kong.

In addition, it also intends to expand compound capacity from the current 9,000 t/y to 10,000 t/y at its Hongkong base on a scrap-and build basis. It has resin compounding bases in Brazil (6,000 t/y) and the Netherlands (12,000 t/y) as well.

TOSOH TO EXPORT SYNTHETIC RESIN TO CHINA AND SOUTH EAST ASIA

Tosoh Corporation will export synthetic resins — mainly low-density and high-density polyethylene (LDPE and HDPE) and EVA (ethylene-vinyl acetate copolymer) — to China and Southeast Asia from this year on a full scale. Amid continued economic growth in these regions, demand for synthetic resins is increasing and Tosoh will thus cultivate markets from a long-term point of view.

At the beginning of this year supply negotiating with major processors in Hong Kong and Thailand were completed and Tosoh will export 20-20,000 tonnes a year to start with. So far the company has mainly proceeded with resin business in the domestic market. As demand is increasing sharply in China and the synthetic resin market in Southeast Asia is expanding, Tosoh has decided to export to China and Southeast Asia. Recently the domestic market has been sluggish.

TAIWAN FIRM TO BUILD BIG ABS, PS PLANTS IN CHINA

Chimei Industrial Co. of Taiwan has rewealed that it will construct a 300,000 t/y ABC (acrylonitrile butadiene styrene) plant and a 300,000 t/y PS (polystyrene) plant in Meizhou, Fuzian Province of China by 1994-Mid-1995. When these plants are completed, Chimei will be the world's top ABS and PS maker with combined capacities of nearly 1,000,000 t/y and 500,000 t/y. The ABS capacity if materialized, will be far larger than that of the U.S.'s GE Plastics, now ranking first, and the combined capacity of all Japanese ABS makers reaching slightly more than 650,000 t/y.

The project in China is in line with China's policy of stressing economic construction by opening up to the outside world. In particular, Meizhou of Fujian Province is the district where top priority has been placed on economic and industrial development.

The Taiwanese firm will import materials from overseas for ABS and PS in the initial stage but suggests the possible use of Chinese materials in future as China plans to build a number of naphtha crackers in Meizhou. The firm will invest about $300 million in the project in China. The company is already exporting to China 45-50,000 t/m of ABS and PS on average; in March its exports rose to 70,000 tonnes. It is believed that Chimei will dominate the Chinese market for ABS and PS and also play a decisive role in the Southeast Asian market.

The Taiwanese firm has also purchased a plot of land in Houston, Texas, the U.S. to prepare for production of such resin in the States which is the largest market. This indicates that Taiwanese petrochemical makers, centred on Chimei and Formosa Plastics Corpn., along with their South Korean counterparts, are emerging as a distinctive power on the world market under their own global strategies.

Chimei constructed in 1988 a 340,000 t/y ABS plant in Taiwan targeting the domestic and Hong Kong markets; the capacity is planned to be raised to 500,000 t/y by the end of 1992 and further to 650,000 t/y by the spring of 1993. Its existing plant has been running at full capacity. Chimei's resins have a competitive edge in price over other equivalents as the firm has taken the advantage of the scale merit of its production systems. It is thus the most powerful supplier of ABS, PS and AS in the world.

New Developments from Japan

UNIQUE UV-CURED RESIN DILUENT FAR LESS IRRITANT, EASY TO USE

Kohjin Co. has developed manufacturing technology for acryloyl morpholine (ACMO), an acrylamide derivative to be used as a less-irritant reactive diluent for UV-cured resin. This is said to be a world first. The firm will commercialize the chemical from July.

ACMO is a water soluble monomer whose polymer is also double in water and highly compatible with a variety of prepolymers and multifunctional acrylate. The new chemical is far less irritative to the skin than conventional acrylic-acid ester-based UV-cured resin. In addition, it hardly has a bad odor.

The firm expects ACMO to be used effectively as an easy-to-handle reactive diluent for UV-cured resin and, in future, as an efficient modifier for commodity resins. The chemical also has good wettability with various resins and can thus be used for a wide range of resins. It will find a market, for the moment, for use in inks and paints, the company believes.

Kohjin intends to cultivate the domestic market for ACMO for the time being but wants to exploit foreign markets, too, in a few years. The firm plans to expand ACMO capacity to 500 t/y within several years. the chemical will be marketed for Yen2,000 ($15) per kilo gram.

MUCH LIGHTER CONCRETE PARTITION WALL DEVELOPED

Kajima Corporation and Mitsui Mining Company have announced that they have jointly developed carbon fibre-reinforced concrete (CFRC) using coal-source aromatics as material. The CFRC can be formed into curtain walls far lighter and thinner than conventional concrete partition walls. The CFRC is made by mixing concrete with the new carbon fibre developed by Mitsui Mining and cut into lengths of about 3 mm. The carbon fibre has a high level of surface activity to firmly combine with concrete the firm says. It is earily dispersed into mortar to produce flexible, stable and high-quality CFRC.

The two firms have continued tests on the product by applying it to partition walls and other construction and housing materials. Kajima is one of Japan's leading contractors. The CFRC obtained by blending the carbon fibre at the rate of 1-2% by weight has good tensile strength (80 kg/mm^2) and flexural strength (2-5 times that of conventional type).

Processed into a curtain wall, it is one-third to one-fifth lighter and thinner than conventional ones, helping to considerably reduce the weight of buildings and facilitate construction work.

Mitsui Mining will complete, as a first step, a 100 t/y semicommercial plant for the CFRC by May before starting construction of a commercial plant this fall.

USED THERMOPLASTIC CAR PARTS TO BE RECYCLED: NISSAN MOTOR

Nissan Motor Co. has established technology for utilizing used thermoplastic-resin parts for stampable sheets. With this method, stampable sheets containing used plastics at the rate of 60% or less have properties comparable with those entirely made of new plastics, the company says.

Used plastic parts such as instrument panels and bumpers are first crushed into fine particles, to which glass fibre and thermoplastic-resin powder are added. The mixture is then blended in water so that the components are mixed uniformly; solid pieces are strained to form a sheet as in the case of making paper and are pressed into a stampable sheet.

The firm has also developed technology for recycling such stampabale sheets. From now on the company will try to apply used plastics to new car parts with the new technology. The new technology requires no peeling off of the coated surface of used plastic parts and makes it possible to utilize nylon, ABS and thermoplastic resins other than polypropylene. This cuts recycling costs.

The Japanese motor giant started last August within itself a recycling promotion committee to prepare for recycling plastic auto parts; since this February it has been tackling the collection of used plastic bumpers in Kanagawa Prefecture.

1-COMPONENT-TYPE CAR-USE TOUCH-UP PAINTS POSSIBLE

Osaka-based Isamu Paint Co. has developed a unique hardening agent facilitating the touch-up of car bodies. The agent makes it possible to produce 1-component-type metallic paint for repairing cars.

Paints for the touch-up of car bodies are prepared in most cases by mixing a resin paint, a paint-hardening agent and a solvent prior to paint application. Prevalent urethane isocyanate-based hardening agents immediately cure paints when mixed with solvents such as thinner, and so it has been considered very difficult to make such paints into 1-component type prior to shipment.

1-Component-type touch-up paints have long been waited for because of labour shortages at repair shops and the necessity of elevating touch-up efficiency. The new agent has the following advantages: (1) 1-component-type

touch-up metallic paints are possible; (2) it produces no carbon dioxide at the time of mixing, producing little vapour in coatings; (3) it has a far lower vapour pressure — as small as one-200th that of other equivalents; producing less harmful gases; and (4) it hardens paints faster than in the case of using conventional ones after application, reducing nonuniformity.

NONHALOGEN FLAME-RESISTANT COMPOUND FOR PP TO BE MADE

Chisso Corporation will install within the year a production line for a nonhalogen compound used for imparting flame resistance to polypropylene (PP). The firm also intends to add similar lines for high-density polyethylene, ABS and polystyrene.The PP-compound line at the Goi factory will cost Yen 300-500 million ($2.27-3.79 million).

The fireproofing compound without harmful halogen substances was jointly developed by Chisso and Himont Inc. of the U.S. belonging to Montecatini of Italy. The chemical is a combination of special ammonium polyphosphate developed by Chisso and a nitrogen-based organic compound developed by Himont.

The flameproofness the PP-use compound imparts clears not only the U.S. UL standard (94V.o) for bromine (halogen)-based flame retardants but also the U.S.'s higher-level standard, according to Chisso. The new retardant also makes the PP in which it is used produce little smoke and non-black smoke when heated. The Japanese firm is also intend on expanding the grades of the compound and producing similar compounds for other polymers in future.

BIOENGINEERED HUMAN CELLS USEFUL: STUDY GROUP

A group of researchers at Ajinomoto Co. and Kyoto University have succeeded in developing technology for producing physiologically active substances using genetically engineered human cells. The technical breakthrough was achieved by employing the MDR gene — which produces P sugar protein resistant against pharmaceuticals — as vector.

They incorporated the gene for human erythroblast-differentiation factors (EDFs) into the said vector and introduced the resultant product into the MP-2 cell derived from human pancreas cancer. They have thereby obtained bioengineered cells capable of producing 100 times as many EDFs as the original cells.

There is a good possibility that employment of human cells may facilitate production of protein having the same structure — sugar-chain structure in particular — as that of human physiologically active substances.

Combination of host cells and vectors both derived from mammals (Chinese hamsters, etc.) has to date been practically used for production of physiologically active substances for pharmaceutical applications.

COLLAGEN INTAKE MAY PREVENT RHEUMATISM

A research group at College of Agriculture, University of Tokyo has confirmed via animal tests that collagen-added feed is effective for prevention of collagen-induced rheumatism. They claim that few rheumatic symptoms developed for mouse models which took collagen containing feed for two weeks but other models suffered from the disease.

Collagen-induced rheumatism is caused by immune reaction against type-II collagen forming the chief constituent of the connective tissue of the human body. The number of related cases is increasing in Japan year by year but an efficient preventive has yet to be established.

The research group inaugurated the animal tests, paying attention to a research report saying that oral administration of pollen is effective for pollinosis (hay fever) patients. They plan to orally give collagen to humans and, if the clinical trials prove successful, apply the product to the production of foods capable of preventing rheumatism.

ECO-FRIENDLY TECHNOLOGY TRANSFER TO CHINA ADVISED

The China Committee attached to The Society of Chemical Engineers, Japan has worked out proposals for technical aid to China. Included therein is transfer of environmental protection technologies.

They are a simple desulfurization process designed to produce crude ammonium sulphate from dilute ammonia water, technology for converting low-grade coal into raw material for town gas and a plant for changing city carbage containing cinders into compost usable as soil conditioner; the crude ammonium sulphate will be applied to alkaline highlands.

The committee also refers to cooperative development of a high performance incineration system of high-concentration waste water emitting from Chinese chemical plants. It has proposed that Japan should set up an environmental-technology transfer centre aimed at promoting the above-mentioned technical support and joint technology development. The society plans to form a working group intended to deliberate on personnel exchange and technical assistance.

The committee claims that spreading employment of environmental protection technology sucessfully in China depends on whether it has a close relationship with production activities.

MARKET INFORMATION

Hike in sales tax subdues markets

The decision of the Maharashtra Government to increase sales tax on dyes and chemicals to 10% has resulted in a sharp drop in offtake. Manufacturers feel that the hike will hit their margins. Purchases are being put off. It is also learnt that traders have protested the move. Arrivals of cyanuric chloride resulted in reduced availability and price rose by Rs. 7/- per kg. Offtake in most chemicals, was poor.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on May 12, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.00
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	4.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	102.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	5.00
Borax (Granular)	35.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	85.00
Butyl carbitol	110.00
Caustic soda (Flakes)	18.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	6,400.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	195.00

Hydro	58.00
Hyflosupercell	42.00
Hexamine (Resale)	34.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	60.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	210.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	42.00
Phthalic anhydride (Resale)	42.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	95.00
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	70.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	115+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	16.50
Acetic Anhydride (Resale)	34.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	62.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	115.00
Chloroform	65.00
Carbon Tetrachloride	27.00
Cellosolve	70.00
Cyclohexanone	80.00
Cyclohexanol	85+ST
Diacetone (Resale)	29.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG) (Resale)	48.00
Dioctyl Phthalate	69.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	24.00
Ethyl Acrylate	92.00
Ethylene Dichloride	21.00
Ethylene Glycol	32.00
Formic Acid (Imp.)	34.00
Formaldehyde (Resale)	7.75
Glycerine (CP)	70.00
Glycerine (IW)	65.00
Hydrogen Peroxide 50% (Resale)	45.00
Isopropyl Alcohol	42.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	115.00
Melamine	62.00
Methyl Ethyl Ketone	60.00
Methyl Isobutyl Ketone	60.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	30.00

Carbitol	115.00+ST
Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	66.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	17.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.50
Xylene (Ortho)	25.50

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	92.00
Alpha Naphthol (Imp.)	230.00
Aceto Acetic Ester (Methyl)	140.00
Acetanilide	62.00
Anthraquinone	135.00
Anthranilic Acid	115.00
2-Amino 4-Nitrophenol	160.00
Blue B. Base (Local)	330.00
Beta Naphthol	75.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid (IDI)	650.00
BON Acid	130.00
CPC (Crude)	115.00
Chicago Acid (Atul)	350.00
Coach Acid	68.00
Cyanuric Chloride (German)	265.00
DEMAP	275.00
2,4-DNCB	35.00
Dichlone (Imp.)	450.00
Dimethyl Aniline	85.00
Diethyl Aniline	145.00
Diethyl Sulphate (Japan)	93.00
Diethyl Sulphate (Local)	80.00
Diamino stilbene disulphonic acid	210.00
3,3-DCB	260.00
Diphenylamine (U.K.)	155.00
Gamma Acid (Atul)	225.00
Gamma Acid (Local)	175.00
H. Acid (Atul)	160.00
G. Salt	82.00
J. Acid	375.00
J. Acid Urea	450.00
K. Acid	125.00
MPDS (Local)	155.00
MNA	130.00
Meta Ureido Aniline	190.00
MPD (Local)	175.00
MPD (German)	210.00
N-Methyl J. Acid	515.00
N-Methyl Aniline	125.00
Naphthalene (Refined)	31.50
Ortho Anisidine (OA) (Imp.)	108.00
Ortho Dichloro Benzene (ODCB)	22.00
OT Base	170.00
OT Liquid	75.00
Para Dichloro Benzene (PDCB)	40.00
Para Anisidine (PA local)	160.00
PNA	95.00
Para Cresidine (Imp.)	330.00
Para Amino Azo Benzene (India)	135.00
PNCB (HOC)	50.00
Para Nitro Toluene	85.00
1-Phenyl 3-Methyl 5-Pyrazolone	175.00
Phenyl J. Acid	415.00
PT Base	165.00
Rhoduline Acid	600.00
Resist Salt 80%	26.00
Resorcinol	350.00
Sodium Naphthionate	85.00
5-Sulpho-Anthranilic Acid	115.00
Sulphanilic Acid	35.00
Sulpho Tobias Acid	155.00
Tobias Acid (Imp.)	115.00
Metanilic Acid	48.00
MTD (German)	185.00
Vinyl Sulphone	125.00

Bombay Drugs Market

(Prices as on May 12, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	570
Aluminium Hydroxide IP	43
Ampicillin Sodium	4300
Ampicillin Trihydrate	3250
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2650
Analgin	340
Aspirin IP	105
Atenolol	2450
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1400
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium Lactate	30
Calcium D Pantothenate	1520
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2950
Chlorpropamide	230
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3200
Cimetidine	3350
Citric Acid IP	115
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	2000
Diclofenac Sodium	2500
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	365
Disodium Hydrogen Citrate	120
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2700
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	820
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	115
Hydroxylamine HCl	600
Hydroxylamine Sulphate	115
Ibuprofen IP	470
Imipramine HCl	5000
Indomethazine	1150
I.N.H.	375
Inositol IP	1500
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	110
Lactic Acid (Japan)	165
Levamisole	2000
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	170
L. Lysine Pharma Grade	270
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	325
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	400
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	525
Metronidazole Benzoate	500
Morpholine	180
Neomycine Sulphate	4400
Niacin	300
Niacinamide	385
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4700
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	150
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	380
Piperazine Hexahydrate	175
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2100
Pyremethamine	2100
Pyroxicam	3200
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	250
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	850
Sulphacetamide Sodium	380

Product	Rs./kg.
Sulphadoxine	2900
Sulphamethoxazole	390
Sulphasomidine	475
Sulphaphenazole	325
Terbutaline Sulphate	30000
Tinidazole	480
Theophylline Anhydrous	415
Thiacetazone	325
Thoridazine HCl	20000
Thycol (Potassium Gluconate Sulphate)	500
Tolbutamide	225
Trifluopromazine HCl	12500
Trifluoperazine HCl	12500
Trimethoprim IP	1850
Tween 80	275
Vitamin B6 Hydrochloride	2900
Vitamin B2 5-Phosphate	4500
Vitamin K-3 (Water soluble)	750

DRUGS INTERMEDIATES

Product	Rs./kg
1-Amino-4-Methyl Piperazine	1400
2-Aminopyridine	575
Beta Picoline	230
2-Chloro Propionic Acid	50
2-Chloro Propionic Chloride	80
3-Chloro 4-Fluoro Aniline	1500
2:4-Dichloro Benzoic Acid	550
2,6-Dichloro Aniline	775
3,4-Diamino Benzophenone	470
Diethyl Malonate	95
Diethyl Oxalate	45
Dimethyl Acetamide	175
Dimethyl Amino Ethyl Chloride HCl	220
Dimethyl Dichloro Silane	195
Dimethyl Sulphoxide	170
Furoic Acid	165
Isobutyl Benzene	190
Lasamide	875
2,6-Lutidine	1750
1-Methyl 1-Amino Methyl Thio 2-Nitro Ethane	1550
2-Methyl 5 Nitro Imidazole	180
Methyl Acetoacetic Ester	160
Methyl Chloro Formate	100
Methyl Isothiocyanate	400
Nitromethane	200
N-Butyl Diethyl Malonate	170
N-Methyl Piperazine	850
Ortho Nitro Benzaldehyde	1400
Para Chloro Benzoic Acid	190
Para Hydroxy Acetophenone	800
Para Hydroxy Phenyl Acetamide	1800
Pivaloyl Chloride	410
Propionic Anhydride	280

Bombay Dyes Market

(Prices as on May 12, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange Y	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.1
Dark Brown 3B	411.1

BASE COLOURS	Per Kg
Fast Yellow GC	77.7
Fast Orange GC	128.4
Fast Scarlet R	198.0
Fast Scarlet RC	128.4
Fast Scarlet RCR	105.6
Fast Scarlet G	115.7
Fast Scarlet GN	92.9
Fast Scarlet GG	77.7
Fast Scarlet GGS	73.9
Fast Red B	233.5
Fast Red RC	115.7
Fast Red R Flakes	158.8
Fast Red TR	181.6
Fast Red TR Oil	223.3
Fast Red RL	251.2
Fast Red KB Oil	251.2
Fast Bordeaux GP	236.0
Fast Garnet GBC	103.0
Fast Violet B	548.8
Fast Blue BB	566.5

NAPHTHOL COLOURS	Per Kg
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: MAY 8 (NNS) In a lacklustre trading, an easy-to-firm tendency was noticed in most of the chemical items in the local chemicals market during the week under review. Following lack of buying support from cold-drink manufacturers because of off-marriage season, citric acid, slumped by Rs. 150/250 at Rs. 5650/5750 per 50 kg. Ban on khyoa and paneer and their products further dampened the sentiment. In the absence of support, tartaric acid France, lost Rs. 6 at Rs. 506 per kg. Ammonia bicarb slipped by Rs. 2 per bag of 25 kg. for want of support. On arrivals of about 20 tonnes of imported goods coupled with lack of follow up support, hydrogen peroxide eased by Rs. one at Rs. 43.50/44 per kg. On liquidation of inventories by the stockists, and in the absence of follow up support, slack wax nosedived by Rs. 500 at Rs. 12,500 per tonne and paraffin wax declined by Rs. 25 at Rs. 1125 per 50 kg. Safolite closed the week with a loss of Rs. one at Rs. 81 per kg due to poor offtake while after initial setback, chatkolite reverted back to its last week closing of Rs. 76 per kg.

On better buying support from consumers, sodium hydro sulphite Gulshan improved by Rs. one at Rs. 55 per kg while borax granular suffered a setback of Rs. 50 at Rs. 1750 per 50 kg due to slack demand from glass industries. Following paucity of ready stock coupled with better buying support, borax crystal, spurted by Rs. 50 at Rs. 1950 per 50 kg. Similarly due to restricted supply, boric acid technical remained firm at its last week closing of Rs. 2900 per 50 kg. Due to weak demand, formic acid, lost Rs. one per kg. Due to restricted supply coupled with depleted stock, titanium dixoide K.Brand improved to Rs. 64 from Rs. 62 per kg while TTP and RC-822 titanium dioxide remained stable at their last week closing of Rs. 65 and Rs. 94 per kg respectively. Napthalene balls, marked up by Rs. 50 at Rs. 2200 per 50 kg due to zooming demand with the onset of summer. Following lack of enquiries from foreign buyers, menthol bold slumped by Rs. 5 at Rs. 260 per kg while menthol flake having jumped up to Rs. 237 from Rs. 232 per kg again lost Rs. 3 at Rs. 234 per kg still showing a gain of Rs. 2 per kg over its last week level.

(DELHI MARKET RATES AS ON MAY 8, 1992).

Ammonia Bicarb (Per 25 Kg.)	178.00
Mercury (Per flask)	7,400.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	840/850.00
Citric acid (Per 50 Kg.)	5,650/5,750.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCI (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	415/425.00
Sod. Hydrosulphite (Per Kg.)	55.00/64.50
Rangolite (Per Kg.)	120.00
Safolite (Per Kg.)	81.00
Chatkolite (Per Kg.)	76.00
Decolite (Per Kg.)	120.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,900.00
Paraffin Wax (Per 50 Kg.)	1,125.00
Slack wax (Per metric tonne)	12,500.00
Tartaric Acid (France Per Kg.)	506.00
Borax Granular (Per 50 Kg.)	1,725.00
Borax Crystal (Per 50 Kg.)	1,950.00
Sodium Nitrite (Per 50 Kg.)	725/800.00
Sodium Nitrate (Per 50 Kg.)	525.00
Camphor Thal (Per Kg.)	140.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	260.00
Menthol Medium (Per Kg.)	252.00
Menthol Flake (Per Kg.)	234.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	162.00
Glycerine (Per Kg.)	65.00/70,00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.00
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	43.50/44.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (50 Kg.)	625/630.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	65.00
Titanium Dioxide RC-822 (Per Kg.)	94.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	64.00
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	57.00/67.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	31.75/32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,200
Match Wax	18,000.00
Residue Wax	7,600.00
Decolite	96.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T.	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

Markets are settling down and availability of most items are getting better. Stable bleaching powder prices went up to Rs. 350/- per bag due to increase in price by manufacturers. Similarly prices of IPA, DAA, Butanol have been revised by manufacturers. Prices of DEG have gone down due to revision in price. Polyethylene glycol 400 upwards have been reclassified under central excise attracting 40% duty and this has put up the prices substantially.

(MADRAS MARKET RATES AS ON MAY 9, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.50
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	45.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	10.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per 50 kgs)	350.00
Borax (per 50 kgs)	1,700.00
Boric Acid (per 50 kgs)	3,400.00
Calcium Chloride Solid (per kg)	4.50
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	8.00
Calcium Carbonate (Precipitated) (per kg)	6.75
Caustic Soda Flakes (per kg)	18.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	39.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.50
Ferrous Sulphate Crystal (per kg)	10.50
Hydros (TCPL) (per kg)	58.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	46.00
Hyflosupercell (per kg)	44.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	30.00
Magnesium Chloride (per kg)	5.00
Magnesium Sulphate (per kg)	5.50
Mercury (per 34.5 kgs)	8,600.00
Nickel Chloride (per kg)	210.00
Nickel Sulphate (per kg)	210.00
Phosphoric Acid (per kg)	35.00
Potassium Carbonate (per kg)	35.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	520.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	12.00
Sodium Sulphite (per kg)	14.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	28.00
Trisodium Phosphate (per kg)	16.00
Titanium Dioxide (Anatase) (per kg)	68.00
Titanium Dioxide (Rutile) (per kg)	99.00
Zinc Chloride (per kg)	21.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	14.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	35.00
Acetic Acid (per kg)	22.00
Acid Slurry (per kg)	36.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	130.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	67.00
Glue Flakes (per kg)	18.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	400.00
Oxalic Acid (per kg)	18.00
Pentaerythritol (per kg)	68.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	215.00
Phthalic Anhydride (per kg)	45.00
Sodium Acetate (per kg)	14.00
Sodium Alginate (per kg)	285.00
Sorbitol (per kg)	27.00
Urea (Technical) (per kg)	4.00

SOLVENTS

Acetone -- HOCL (per kg)	30.00
Benzene (per litre)	22.50
Butanol (per kg)	50.00
Butyl Acetate (per kg)	52.00
Carbon Tetra Chloride (per kg)	27.00
Cellosolve (per kg)	80.00
Chloroform (per kg)	32.00
Diacetone Alcohol (per kg)	45.00
Diethylene Glycol (per kg)	45.00
Di-butyl Phthalate (per kg)	66.00
Di-octyl Phthalate (per kg)	68.00
Ethyl Acetate (per kg)	27.00
Isopropyl Alcohol (per kg)	43.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	27.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	53.00
Octanol (per kg)	75.00
PEG 400 (per kg)	75.00
Perchloroethylene (per kg)	39.00
Propylene Glycol (per kg)	67.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	38.00
Toluene (per kg)	24.00
Xylene (per kg)	30.00

CALCUTTA MARKET
(Prices as on May 10, 1992)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	2,750.00
Camphor (per kg)	92-94.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	800.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	285.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Sulphur in powder/Refined sulphur

Industrias Purace S.A., Carrera 40 No. 11-59, Urbanizacion Acopi, P.O. Box: 5676, Cali Valle, Colombia. Fax: 653078; Telex: 55444 INPUR.

Barytes

Baroid de Venezuela S.A., Attention: Tommy Thompson, Ave. Orinoco, Edf. Centro Empresarial Roca, Pisos 2° y 3°, Las Mercedes, P.O. Box 60762, Carachas, Venezuela. Tel: 922111; Fax: 929270; Telex: 27809.

Hydrochloric acid 33% (food tech.)

Compania de Sintesis de Productos Quimicos S.A., Tte, Gral. Peron 2630, 5°C, 1040 Buenos Aires, Argentina. Tel: 9511765, 8511465; Fax: 9538445; Telex: 21420.

Sulphuric acid

Wyandotte de Venezuela C.A., Attention: Anibal A. Garcia, Ave. Principal Colonas de Bello, Monte, Edf, Oficentro Piso 5°, Caracas, Venezuela. Tel: 7520055.

Sodium sulphate

B. Altman & Cia S. en C., P.O. Box: 20264, Cali, Valle, Colombia. Tel: 923-694977; Fax: 923-694977; Telex: 55922 CXCAL.

Magnesium sulphate

Productos Corzo S.A., Attention: Alfredo Cordoba, Gerente General, Camino Real de Xochimilco No. 17, Col. Tepepan 16020, Mexico, D.F., Mexico. Tel: 5-5946955, 5-6760932.

Copper sulphate

Zn Fundicaiones C.A., Attention: Mario Licciardino, Zona Industrial de Santa Cruz, 2 Ave. Pcla No. 624, Cagua, Ofc. Multicentro, P.O. Box 1359, Cagua 29, Venezuela. Tel: 044-78432, 044-70486; Fax: 044-78643.

Sodium pyrophosphate/sodium tripolyphosphate

Tripoliven C.A., Attention:Manuel Dario Penso, Ave. Fco. de Miranda, Edf. Parque Cristal, Torre Este, Piso 11, Ofc. 11-9, P.O. Box: 58, Oos Palos Grandes, Caracas, Venezuela. Tel: 042-71921; Fax: 042-71712; Telex: 42496.

Calcium carbonate

Colombiana de Coloidales S.A., Kmt. 30, Autopista Medellin-Bogota, P.O. Box: 57029, Medellin, Antioquia, Colombia, Tel: 2621611.

Sodium silicate

Venezolana de Silicatos C.A., Venesil, Edf. Iasa, Piso 7°, Ofc. 701, Ave. Principal, La Castellana P.O. Box: 61564, Caracas, Venezuela. Tel: 562-321274; Fax: 562-617922; Telex: 23672 VENSI VC.

Phthalic anhydride

Anhidridos y Derivados de Colombia A.A., Andercol, Autopista Norte No. 95-84, P.O. Box: 2065, Medellin, Antioquia, Colombia. Tel: 4-2670083, 4-2678056; Fax: 4-2678135; Telex: 65015 ANDER CO.

Ammonium nitrate/ammonium sulphate

Eastern Europe Inc., Attention: Dr. Robert Ross, 460, West 34th Street, 12th Floor, New York, NY 10001, United States. Tel: 212-9478585.

Natural dyestuffs

B. Altman & Cia, S. en C., P.O. Box: 20264, Cali, Valle, Colombia. Tel: 923-694977; Fax: 923-694977; Telex: 55922 CXCAL.

Pigments in powder

Procal S.R.L., Attention: Dr. Jorge Horacio Ruiz, Salta 4059, 1754, San Justo, Buenos Aires, Argentina. Tel: 6519347, 6518821; Fax: 3319123; Telex: 21604 ARGEST AR.

Insecticides

Shell Colombia S.A., Carrera 7, No. 73-47, P.O. Box: 58642, Santafe de Bogota, D.C., Colombia. Tel: 571-2100100; Fax: 571-2173600; Telex: 44792.

Herbicides

Productos Fitosanitarios Proficol, El Carmen S.A., Calle 85, No. 9-65, Santafe de Bogota, D.C., Colombia. Tel: 2579100; Fax: 2187168; Telex: 44895.

Disinfectants

Nardos, Bakkevangen 4, DK 8400 Ebeltoft, Denmark. Tel: 45-86336088; Fax: 45-86336122.

Solvents and thinners

Venezolana de Solventes y Quimicos S.A., Attention: Marco Madrazo Perez, Ave. Bolivar C/148, Urb. Carabobo, Centro Professional Norte, Piso 1°, Ofc. 1-1, Valencia, Estado Carabodo, Venezuela. Tel: 041-218915; 041-218926; Fax: 041-218926; Telex: 45453.

Polypropylene resins

Eastern Europe Inc., Attention: Dr. Robert Ross, 460, West 34th Street, 12th Floor, New York, NY 10001, United States. Tel: 212-9478585.

Plasticized polyvinyl chloride

Petroquimica Colombiana S.A., Calle 8B No. 68-25, P.O. Box: 14451; Santafe de Bogota, D.C., Colombia. Tel: 1-2622811, 1-2618143; Fax: 1-2627-502; Telex: 44668 PETQ CO.

Resins

Venezolana de Resinas C.A., Atten-

tion: Hernan Morales, Ave. Libertador, Multicentro Empresarial del Este, Torre Libertador, Planta, P.O. Box 62032, Chacao, Caracas, Venezuela. Tel: 2614669, 2618303; Fax: 2615231; Telex: 23570.

Sulphur, all kinds

Sulco S.A., Carrera 40 No. 11-159, Urbanizacion Acopi, P.O. Box: 5676, Cali, Valle, Colombia. Tel: 653100; Fax: 5723-653078; Telex: 55444 INPUR.

Bentonite

Baroid de Venezuela S.A., Attention: Tommy Thompson Ave. Orinoco, Edf. Centro Empresarial Roca, Pisos 2° y 3°, Las Mercedes, P.O. Box: 60762, Caracas, Venezuela. Tel: 922111; Fax: 929270; Telex: 27809.

Sulphuric acid

S & C Trading Co. Ltd., 432, Keelung Road, Sec. 1, Taipei, Taiwan ROC. Tel: 8862-7295022; 8862-7295340; Fax: 8862-7298901.

Magnesium oxide for agricultural purposes

Minerales Exclusivos y Cia, S.C.A., Carrera 5 No. 12-49 Sur, P.O. Box: 44448, Santafe de Bogota, D.C., Colombia. Tel: 7813351; 7812670; Fax: 7816579.

Calcium chloride

Gallego Pelaez Colombia Ltda., Calle 11, No. 33-06, Santafe de Bogota, D.C., Colombia. Tel: 2016099; Fax: 2016099.

Ethyl chloride

Prodicast Ltda., Diagonal 110 o. 16-47, Ofc. 302, P.O. Box: 251938, Santafe de Bogota, D.C., Colombia. Tel: 1-6121724; 1-6121606; Fax: 1-6121606.

Aluminium sulphate without iron contents

Sulfatos de Orinoco C.A., Sulforca, Zona Industrial Matanzas, P.O. Box: 62236, Puerto Ordaz, Bilivar, Venezuela. Tel: 086-992679; Fax: 086-992678; Telex: 24802.

Ethyl acetate

Pavco, Ave. Federico Lleras No. 57-80, Sur, P.O. Box: 14456, Santafe de Bogota, D.C., Colombia. Tel: 1-777-5711; Fax:1-7761788; Telex: 041421.

Colouring matters for textiles, dyes and plastic industries

Holliday Dyes & Chemicals Ltd., Leeds Road, P.O. Box: 22, Huddersfield HD2 1UH, United Kingdom. Tel: 0484-421841; Fax: 0484-515328; Telex: 51433.

Solvents and thinners

Baroid de Venezuela S.A., Attention: Tommy Thompson, Ave. Orinoco, Edf. Centro Empresarial Roca, Pisos 2° y 3°, Las Mercedes, P.O. Box: 60762, Caracas, Venezuela. Tel: 922111; Fax: 929270; Telex: 27809.

Polyethylene

Camara de la Industria de Especies Alcoholicas, Ave. Fancisco de Miranda, Urb. Los Palos Grandes, Centro Plaza, Torre C, Caracas 1062, Venezuela. Tel: 2-2843675, 2-2843946; Telex: 25377.

Resins

Barnix S.A., Attention: Diego Jimenez, Ave. Principal de Los Ruices, Edf. Oficentro, Piso 1°, ofc. A-1, Caracas, Venezuela. Tel: 361190, 340534; Fax: 380555; Telex: 21818.

Polyurethane

Suelatex C.A., Attention: Francisco Marquez, Calle 1, La Yaguara, 1/2, Cuadra de La Inspectoria de Transito, Caracas, Venezuela. Tel: 494416, 494419; Fax: 495685; Telex: 26480.

EXPORT OPPORTUNITIES

Gypsum

Industrias Dentales Ltda., Attention: Mauricio Gonzalez S., Gerente General, Calle 57 No. 50A-3, P.O. Box: 816, Medellin, Antiqoquia, Colombia. Tel: 2425420, Fax: 2510598.

Urea 46%

Konig Direct, Attention: Mr. Mikael Konig, Horizontvagen 25 BV, S122 54 Enskede, Sweden. Fax: 46-8724914.

Solvents and thinners

Ji Chen Co. Ltd., Rm. 3-1, 1 Chung Ching S. Road, Sec. 3, Taipei, Taiwan ROC. Tel: 8862-3911111; Fax: 8862-3910961.

Organic chemicals

Sunshine Corporation Ltd., Ellal Chamber, 1st Floor, 11, Motijheel Commercial Area, Dhaka 1000, Bangladesh. Tel: 880-2231692, 880-2231473; Fax: 880-2833443; Telex: 675553 SCL BJ.

Chlorine

Pioneer Chlor Alkali Co. Inc., Attention: B.L. Bennett, Gerente de Planta, River Road, P.O. Box 23, St. Gabriel, LA 70776, United States. Tel: 504-6421800; Fax: 504-6421882.

Caustic soda liquid

Tintoreria El Dorado Ltda., Attention: Felipe Cusnir, Assistance de Gerencia, Calle 65 Bis No. 92-59 Alamos, P.O. Box: 6853, Santafe de Bogota, D.C., Colombia. Tel: 2231077.

Zinc chloride

C.F. Dahiberg and Co. Inc., Attention: C.F. Dahlberg, Presidente, 601, Poydras Street, Suite 2415, New Orleans, LA 70130, United States. Tel: 504-5225700; Fax: 504-5225718; Telex: 283-984 DALCOUR.

Fertilizers

S & C. Trading Co. Ltd., 432, Keelung Road, Sec. 1, Taipei, Taiwan ROC. Tel: 8862-7295022, 8862-7295340; Fax: 8862-7298901.

Aldubaibi General Trading & Contracting Est., P.O.Box: 25249, Safat 13113, Kuwait. Tel: 2460942, 2460943; Fax: 2460944.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Haryana Agro Industries Corporation Ltd., Attn: Managing Director SCO No. 825-826, Section 22-A, Chandigarh.	Isoproturon technical	130 MT		25.5.92
	DDVP Technical 92% purity	1,840 MT		"
	Malathion tech. 95% purity	11,500 MT		"
	Emulsifier for malathion 50% EC	865 Kg		"
	Emulsifier for DDVP 76%.	200 Kg		"
	C-IX	1600 Lit.		"
	Xylene	300 Lit.		"
	Triethanolamine	25 Kg.		"
	Tin container 5-lit. capacity	2000 Nos.		"
Indian Petrochemicals Corpn. Ltd. Attn: Sr. Materials Manager, Maharashtra Gas Cracker Comp. Divn., Nagothane, Dist. Raigad, Maharashtra.	Tertiary butyl catechol	5 MT	GCC/MM/92/ 50/0011	21.5.92
Oil & Natural Gas Commission Attn: General Manager (MM) Drilling Business Group, Bombay Reg. Business Centre, 3-B, Vasudhara Bhavan, Bandra (East), Bombay 400 051.	Refrigerant R-22 gases in ONGC cylinders	6466 Kgs.	BRBC/DRL/STR/ IND(S)/218/91/ OT-108	9.6.92
	Oxygen, dissolved acetylene and nitrogen gases in ONGC cylinders.		BRBC/DRL/STR/ IND(S)/255/92/ OT-109	11.6.92
Oil India Ltd. Chief Materials Manager, P.O. Duliajan 786 602, Dist. Dibrugarh, Assam.	Barytes (barium sulphate in free flowing powder form)	4000 MT	LP-879	10.6.92

(Tender forms are also available at their offices at Calcutta, Guwahati and New Delhi)

PLANT & EQUIPMENT

Oil & Natural Gas Commission 2B, Priyadarshini, Eastern Express Highway, Sion, Bombay 400 022.	Gas detector & chromatograph		BRBC/EBG/MM/ IND/102/91/OT-2	29.5.92

TECHNOLOGY

Hindustan Petroleum Corpn. Ltd., Attn: Chief Materials Manager, Refinery Division, Corridor Road, Mahul, Bombay 400 074.	Technology from licensors for manufacture of paraffin wax (installation of wax deoiling unit and wax hydrofinishing unit).		4040/PM-BS-PKS/VCK/FR	2.6.92

INTERNATIONAL BULK CHEMICAL PRICES

SPOT PRICES AS ON APRIL 15, 1992

Product		European Price range	US Price range
Naphtha		$180-182m.t. (cif)	
Gasoil		$177-178/m.t. (cif)	
Propane*		29.25-29.5 cts/gal (fob)	
Butane*		35.25-35.5 cts/gal (fob)	
Ethylene		$360-380/m.t. (cif)	15-16 cts/lb (del)
Propylene —	Chemical grade	DM605-625/m.t. (cif)	12-13 cts/lb (del)
	Polymer grade	DM645-655/m.t. (cif)	13.5-14 cts/lb (del)
Butadiene		$210-220/m.t. (fob)	12-13 cts/lb (cif)
Benzene		$335-345/m.t. (fob)	$1.10-1.20/gal (fob)
Toluene		$265-275/m.t. (fob)	89-90 cts/gal (fob)
Xylenes —	Virgin	$290-295/m.t. (cif)	
	Solvent	$285-290/m.t. (fob)	89-90 cts/gal (fob)
Para-xylene		$370-380/m.t. (fob)	17.5-18 cts/lb (fob)
Ortho-Xylene		$380-390/m.t. (fob)	17-18 cts/lb (fob)
Styrene —	T1	$480-490/m.t. (fob)	
	T2	$505-515/m.t. (fob)	19.75-20.25 cts/lb (fob)
Methanol —	T1	$110-120/m.t. (cif)	
	T2	DM200-210/m.t. (fob)	34-36 cts/gal (fob)
MTBE		$310-315/m.t. (fob)	85-88 cts/gal (fob)
INORGANICS			
Caustic soda		$240-260/m.t. (fob)	$250-265/m.t. (fob)
Soda ash		$190-200/m.t. (fob)	$145-170/m.t. (fob)
POLYMERS			
LDPE	Film grade	$690-730/m.t. (fob)	$650-690/m.t. (fob)
LLDPE	Butene-based	DM1.05-1.15/kg (del)	26-28 cts/lb. (del)
	Hexene-based	DM1.15-1.20/kg (del)*	
	Octene-based	DM1.60-1.75/kg (del)*	
HDPE	Blow-moulding	$640-690/m.t. (fob)	$530-550/m.t. (fob)
	Inj. moulding	$620-660/m.t. (fob)	$540-560/m.t. (fob)
PP	homo-injection	$660-700/m.t. (fob)	$540-570/m.t. (fob)
	copolymer	DM1.15-1.30/kg (del)	40-46 cts/lb (del)
PS	general purpose	$660-720/m.t. (fob)	$667-684/m.t. (fob)
	high impact	$680-740/m.t. (fob)	$720-738/m.t. (fob)
PVC	general purpose	$430-450/m.t. (fob)	$430-470/m.t. (fob)

* Contract price

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
			JNPT (NHAVA SHEVA PORT)	
19/5	G. Petrenko (V-10/92)	Transocean	Odessa; Illyichevsk; Havana (Cuba); Piraeus; Lattakia; Izmir; Mersin; Beirut; Istanbul; Salonika; Alexandria; Limmassol also Rumania & Bulgaria. Also Afghanistan. (Carting at Kalamboli & Taloja).	21/5
			BOMBAY PORT	
18/5	Makalu (Voy-707)	Greenways/	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon; Manchester; Avonmouth; Bremen; Belfast and all Destinations in U.K.; German; Switzerland; Austria and Scandinavian Ports. (Carting at F-PD).	21/5
		Arebee/	P. Said; Alexandira; Piraeus; Venice; Trieste; Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Ravenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). (Carting at M.O.D. No. 1).	
		Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Bremerhaven; Felixstowe; Hull; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Limmassol; Izmir; Mersin; Istanbul; Marseilles; Valencia; Larnaca; La Spezia; Casablanca; Piraeus. (Carting at E-Shed Grain Depot).	
		M.C.S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapest; Russia. (Carting at M.O.D. No. 2).	
		Parekh/	Felixstowe; Hamburg; Premen; Antwerp; Rotterdam; London; Manchester; Liverpool; Birmingham; Leeds; Glasgow; Aarhus; Copenhagen; Gothenburg; Malmao; Oslo; Larnaca; Limmassol; Piraeus; Istanbul; Izmir; Mersin; Lattakia; Beirut; P. Said; Alexandria. (Carting at M.O.D. No. 1).	
		J. Mackintosh	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
18/5	Ilovik	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	20/5
20/5	Lanka Aruna (V-46/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	24/5
20/5	Halberstadt (Ger) (Voy-978)	Trident/P&O/	Jeddah; Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at 12B-ID for Trident) (Carting at T.P. No. 1 for P&O).	23/5
		Merzario/	Jeddah; Ravenna; Venice; Trieste; Ancona; Mersin; Limmassol; Piraeus; Alexandria. (Carting at M.O.D. No. 2).	
		Penguin/	Aqaba. (Carting at M.O.D. No. 1).	
		Patvolk	Aqaba. (Carting at Frere Basin No. 1).	
16/5	Lindesnes	Arcadia	Aden; Hodeidah; Djibouti.	20/5
21/5	Hrvatska	Oceania	Jeddah; Rijeka; Trieste.	27/5
22/5	Travanti	Chowgule	Aden; Hodeidah; Aqaba.	30/5
20/5	Halberstadt (Voy-978)	P&O/	Dubai; Abu Dhabi; Muscat; Doha. (Carting at Timber Pond No. 4).	23/5
		Spoonbill/	Dubai; Sharjah; Ajman; Umm-Al-Quwain; Ras-Al-Khaimah; Abu Dhabi; Doha; Bahrain; Kuwait; Muscat; Bandar Abbas. (Carting at FB No. 1).	
		Patvolk/	Dubai; Muscat; Bahrain. (Carting at Frere Basin No. 1).	
		Silvership/	Dubai; Sharjah. (Carting at Frere Basin No. 1).	
		Penguin/	Dubai; Dammam; Riyadh; Abu Dhabi; Sharjah; Doha; Muscat; Jebel Ali; Bahrain; Kuwait; Bandar Abbas. (Carting at F.B. No. 5 & 6).	

(1)	(2)	(3)	(4)	(5)
		Merzario/	Dubai; Muscat; Sharjah; Doha; Abu Dhabi; Kuwait. (Carting at M.O.D. No. 2).	
		M.S.P.L./	Dubai; Fujairah; Khorfakkan; Sharjah; Abu Dhabi; Muscat. (Carting at F.B. No. 5 & 6).	
		SDS Corpn./	Muscat; Bahrain; Kuwait; Dubai; Sharjah; Abu Dhabi. (Carting at E.G. Depot).	
		Mercator	Dubai; Abu Dhabi; Sharjah; Jebel Ali; Fujairah. (Carting at F.B. No. 1).	
19/5	Ivan Koroteev (Voy-003)	Parekh/	Dubai; Muscat; Sharjah; Bahrain; Kuwait. (Carting at M.O.D. No. 1).	21/5
		Sitara/	Dubai. (Carting at F.B. No. 3).	
		Unimarine/	Dubai; Abu Dhabi; Sharjah; Fujairah; Khorfakkan; Ajman; Doha; Bandar Abbas. (Carting at F.B. No. 2).	
		Spoonbill/	Dubai; Sharjah; Ajman; Umm-Al-Quwain; Ras-Al-Khaimah; Abu Dhabi; Doha; Bahrain; Kuwait; Muscat; Bandar Abbas. (Crtg. at FB No. 1).	
		Merzario/	Dubai; Abu Dhabi; Doha; Sharjah; Muscat; Kuwait. (Carting at M.O.D. No. 2).	
		Seacrest	Dubai. (Carting at Frere Basin No. 1).	
19/5	Kota Cahaya	J. Mackintosh	Baghdad via Aqaba. (Carting at Frere Basin No. 3).	21/5
10/5	Sea Star	Worldlink	Kuwait. (Carting at 4-VD).	22/5
22/5	Hai Lee (V-4/92)	J.M. Baxi	Dubai; Dammam.	25/5
10/5	Gulf Prince	Preetika	Dubai.	26/5
15/5	Rossana	J. Mackintosh	Muscat; Dubai.	22/5
19/5	Kota Cahaya	Trident	Tema/Lome; Lagos; Matadi; Lobito; Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Carting at 12B-ID).	21/5
22/5	Silver Glory (V-1)	Arebee	Lagos/Apapa; Abidjan; Tema (Direct); P. Harcourt; Takoradi; Lome; Cotonou; Douala. (Carting at M.O.D. No. 1).	25/5
18/5	Makalu (V-707)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at F-PD).	21/5
		M.C.S.	Far East & Japan Ports. (Carting at M.O.D. No. 2).	
21/5	Lanka Srimathi	Seahorse	Singapore; Penang; P. Kelang; Bangkok; Hongkong; Keelung; Kobe; Yokohama & FCL only Busan; Inchon; Osaka; Nagoya; Kaohsiung. (Carting at M.O.D. No. 3).	24/5
18/5	Premier (Voy-1818)	Killick/P&O/ F.F.C. Co.	Singapore. (Carting at F.B. No. 3 for Killick and T.P. No. 1 for P&O). (Carting at T.P. No. 1 for F.F.C. Co.).	20/5
20/5	Stamford (V-40W/E)	F.F.C. Co.	Singapore; Jakarta; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at T.P. No. 1).	22/5
		Samrat	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohisung; Keelung; ;Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo; Haipong; Ho Chi Minh City. (Carting at B-PD).	
19/5	Kota Cahaya/ (CAH-004)	J. Mackintosh	Singapore; P. Kelang; Penang, Jakarta; Surabaya; Semarang; Belawan; Kaaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan;	21/5
25/5	Cape Ray		Ulan Battar; Yokohama; Nagoya; Kobe; Ho Chi Minh; Main Chiese Ports. (Carting at Frere Basin No. 3).	27/5
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohisung; Singapore. (Carting at 12B-ID)	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at B-PD for E.S.P.L.).	
		Silvership/	Far East Ports. (Carting at F.B. No. 1).	
		Beacon/	Far East, Main Japan & Chinese Ports. (Carting at E-Shed Grain Depot).	
		Lucky Mari	Singapore; Penang; P. Kelang; Bangkok; Manila; Surabaya; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kaohsiung; Keelung; Busan and Chinese Ports. (Carting at F.B. No. 3).	
17/5	Vishva Ambar	SCI	Singapore; Main Japan Ports.	24/5
27/5	Hallborg	J.M. Baxi	Bangkok; Penang; Jakarta. (Also loads at Bedi).	31/5
11/5	Lyudmila Stal	Transocean	Kobe; Yokohama; Vladivostock.	23/5
21/5	Pavlodar	Transocean	Singapore; Nagoya; Yokohama.	31/5

(1)	(2)	(3)	(4)	(5)
18/5	Makalu (Pan) (Voy-707)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sacramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas.`Various inland desintaions (Carting at F-PD).	21/5
		Marine Trans/	South & Central American Ports. (Carting E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; New Orleans; Oakland; San Francisco. (Carting at M.O.D. No. 2).	
		Arebee	Halifax; Montreal; Toroton; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas; Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tijuana; Veracruze; Mexico; Sao Francis Do Sul; Carribbean; Central & South American Ports. (Carting at MOD No.1).	
20/5	Stamford (V-40W/E)	Samrat	Longbeach; Oakland; Seattle; Los Angeles; San Francisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; Vancouver; Montreal; Toronto; New Orleans; Houston. (Crtg. B-PD).	22/5
24/5	Hoegh Dene (V-0312)	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Savannah; Wilmington; Philadelphia; Baltimore; & FCL Houston; New Orleans; Chicago; Milwaukee; Atlanta; Dallas; Tampico; Mexico City; Veracruz; San Louis; Potossi. (Carting at Hay Bunder No. 5).	26/5
18/5	Premier (Voy-1818)	Killick	South American Ports. (Carting at Frere Basin No. 3).	20/5
19/5 25/5	Kota Cahaya/ (CAH-004) Cape Ray (Voy-2204)	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orleans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American & Pacific Ports. (Carting at B-PD).	21/5
		Trident	S. American; Carribbean & Centrel American Ports. (Carting at 12B-ID).	
18/5	Premier (Voy-1818)	Killick/ P&O	Merlbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon; P. Launceston; Burnie; New Plymouth; Auckland; Wellington; Lyttleton; P. Chalmers; Christchurch; Dunedin; Napier. Also all Pacific island. (Carting at Frere Basin No. 3 for Killick & T.P. No. 4 for P&O).	20/5
		F.F.C. Co.	Auckland; Lyttleton; Sydney; Melbourne; Fremantle; Adelaide; Brisbane. (Carting at Timber Pond No. 1).	
19/5 25/5	Kota Cahaya/ (CAH-004) Cape Ray (Voy-2204)	J. Mackintosh/ Trident/	Brisbane; Sydney; Melborne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 3 for J. Mackintosh). (Carting at 12-B-ID for Trident)	21/5 27/5
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S./	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari.	Melbourne; Sydney; Brisbane. (Carting at F.B. No. 3).	
18/5	Ilovik (V-15) (Cyp) (V-15)	Arebee/	Dar Es Salaam & Mombasa (Direct); Re Union Kamapala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Walvis Bay (Namibia); Zanzibar. (Carting at M.O.D. No. 1).	20/5
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola; (Zambia); Lilongwe; Blantyre. (Carting at T.P. No. 4).	
21/5 29/5	Banglar Moni (Voy-25) Pioner Belorussii (Voy-08)	Sai Ship/	Mombasa; Dar Es Salaam (Direct); Zanzibar; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola; (Zambia); Lilongwe; Blantyre. (Carting at M.O.D. No. 2).	23/5 31/5
		C.M.B.	Dar Es Salaam; Mombasa (Direct); Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in E. Africa. (Carting at E-Grain Depot).	
18/5	Premier	Killick P&O	Colombo. (Carting at T.P. No. 4) (Carting at Frere Basin No. 3).	20/5

(1)	(2)	(3)	(4)	(5)
18/5	Ilovik	P&O	Colombo. (Carting at Timber Pond No. 4).	20/5
19/5	Kota Cahaya	J. Mackintosh	Colombo; Chittagong; Rangoon. (Carting at Frere Basin No. 3).	21/5
15/5	Ramdas	S.C.I.	Colombo.	21/5
			KANDLA PORT	
15/5	Al Wakrah	U.L.A.	Dubai; Dammam.	20/5
18/5	Fremo Sirius (V-1/92)	Sai Ship	Dubai; Bandar Abbas.	

VESSELS DUE FOR IMPORT DISCHARGE (BOMBAY)

Due Date	Steamer's Name	Agents	From
21/5	Banglar Moni (V-25)	Sai Ship	E. Africa
21/5	Hrvatska	Oceanic	Adriatic Ports
20/5	Ibn Al Roomi (V-85)	Transworld	S. America
21/5	Irenes Diamond	Prudential	Cont.
21/5	Pavlodar	Transocean	Far East
21/5	Vishva Asha	S.C.I.	Illyich/Mersin

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

MATERIALS IMPORTED BOMBAY (13.4.92)

(Continued from previous issue)

MESITYLENE: From Japan: Atic Industries Ltd., 3,060 Kgs., Rs. 2,57,927.

NAPHTHALENE CRUDE: From Canada: Chemiequip Ltd., 15.6 Mts., Rs. 2,07,620; Henkel Chemicals India Ltd., 15.6 Mts., Rs. 2,07,619; Shree Hari Chemicals P. Ltd., 15.6 Mts., Rs. 2,16,847; From Egypt: Jalan Trading Co. P. Ltd., 53.156 Mts., Rs. 7,07,450.

ORTHO CHLORO BENZO TRICHLORIDE: From Japan: Kharadi Indl. Estate, 1,000 Kgs., Rs. 1,32,836.

PARA CHLORO TOLUENE: From Japan: Searle India Ltd., 16,000 Kgs., Rs. 7,24,151.

PARAFFIN WAX REFINED: From China: Indian Oil Corporation Ltd., 203.300 Mts., Rs. 55,19,631.

POLYVINYL PYRROLIDENE: From Germany: Trans Chem Corporation, 50 Kgs., Rs. 22,880.

ROSIN ACID: From Australia: Synthetics & Chemicals Ltd., 64 Mts., Rs. 20,91,294.

SODIUM BORATE CRUDE: From Turkey: Mridul Enterprises, 200 Mts., Rs. 23,79,193.

SODIUM MONO FLUORO PHOSPHATE: From Germany: Hindustan Ciba Geigy Ltd., 3,000 Kgs., Rs. 2,85,849.

TARTARIC ACID BP/USP: From Argentina: Cadila Labs. Ltd., 10.18 Mts., Rs. 33,21,909.

TITANIUM DIOXIDE: From USA: International Linkers P. Ltd., 15 Mts., Rs. 7,20,900.

TITANIUM TRICHLORIDE: From Japan: Indian Petrochemicals Corpn., 11.880 Mts., Rs. 33,11,001.

TOLUENE ISOCYANATE: From Singapore: Modern Foam Ind. P. Ltd., 9,500 Kgs., Rs. 5,90,029.

TURPENTINE OIL: From Indonesia: Camphor & Allied Products Ltd., 136 Mts., Rs. 21,51,290.

ZINC OXIDE: From Singapore: Precitex Rubber Inds., 2,260 Kgs., Rs. 2,50,276.

DRUG MATERIALS IMPORTED BOMBAY (13.4.92)

D-PANTHENOL USP: From Japan: Bharat Commercial Co., 500 Kgs., Rs. 3,16,528; Raw Pharma, 500 Kgs., Rs. 3,58,601.

SULPHADOXINE BP: From China: Helios Pharmaceuticals, 500 Kgs., Rs. 5,81,157.

PLASTIC MATERIALS IMPORTED BOMBAY (13.4.92)

HIGH DENSITY POLYETHYLENE: From Canada: Associated Plastics Industries, 35 Mts., Rs. 6,62,490; From Japan: Urvakunj International, 16.500 Mts., Rs. 2,79,600; From Korea: Associated Plastic Inds., 40 Mts., Rs. 8,78,695; Bajaj Polymers, 32 Mts., Rs. 7,55,246; Gadia Chemoplast Pvt. Ltd., 16 Mts., Rs. 3,46,873; Govindlal Alokkumar Trading, 16,000 Kgs., Rs. 3,46,568; Hind Exim, 8 Mts., Rs. 1,73,200; Kailashchand S. Kumar Plast Pvt. Ltd., 40 Mts., Rs. 8,18,545; Kalpesh Plastic Inds., 16 Mts., Rs. 3,51,145; L.P. Gas Equipments Pvt. Ltd., 72 Mts., Rs. 16,83,819; Mehta Traders, 16 Mts., Rs. 3,274; Polychroic Inds., 16 Mts., Rs. 3,27,414; Priya Plastics, 40 Mts., Rs. 8,18,920; Sindu Plastic (I), 16 Mts., Rs. 3,28,062; The Supreme Inds. Ltd., 80 Mts., Rs. 16,35,870; Union Quality Plastics Pvt. Ltd., 16 Mts., Rs. 3,42,077; Vishal Commercial Corpn. 8 Mts., Rs. 1,68,855; Vishal Plastomer Pvt. Ltd., 48 Mts., Rs. 10,25,268; From Saudi Arabia: Hindustan Vacuum Glass Ltd., 34.300 Mts., Rs. 7,50,683; Palma Inds., 17.150 Mts., Rs. 3,75,341; Premier Glass Traders, 33 Mts., Rs. 6,09,992.

HIGH DENSITY POLYETHYLENE: From Thailand: Sindu Plastics, 17 Mts., Rs. 3,66,244; From USA: Kosmo Packers, 16.500 Mts., Rs. 3,17,197.

POLYETHYLENE: From Belgium: Industrial Cables (India) Ltd., 12 Mts., Rs. 7,80,791; Flour & Food Ltd., 60 Mts., Rs. 12,10,732; Brazil: Crown Plastic Inds., 45 Mts., Rs. 9,09,690; Ellora Chemical Works, 5 Mts., Rs. 1,00,387.

POLYPROPYLENE: From Brazil: Gem Properties Pvt. Ltd., 50 Mts., Rs. 10,53,981; Hind Polymers, 18 Mts., Rs. 3,62,984; Maxxon India Ltd., 200 Mts., Rs. 43,29,391; Naresh Traders, 9 Mts., Rs. 1,86,842; Pallavi Udyog, 18 Mts., Rs. 3,78,448; Planter's Polysacks Ltd., 50 Mts., Rs. 10,53,180; Polychroic Industries, 18 Mts., Rs. 3,63,072; Premier Polymers, 8 Mts., Rs. 1,56,799; Priyadarshini Packaging Pvt. Ltd., 45 Mts., Rs. 8,83,494; Rajasthan Synthetic Inds., 50,000 Kgs., Rs. 9,80,951; Shankar Packaging Ltd., 60 Mts., Rs. 11,68,635; The Supreme Inds. Ltd., 400 Mts., Rs. 78,28,311; From Hungary: Associated Brothers, 15 Mts., Rs. 3,14,978; From Italy: Sanatus Drugs & Pharmaceuticals, 15 Mts., Rs. 4,43,066; From Japan: Hindustan Syringes Pvt. Ltd., 15.500 Mts., Rs. 6,05,523; From Korea: Sidharth International 46.5 Mts., Rs. 9,51,105; Vallabh Poly Plast, 15.500 Mts., Rs. 3,45,553; Vipul Plastics, 15.50 Mts., Rs. 3,45,562.

POLYPROPYLENE: From USA: Cosmo Films Ltd., 16.500 Mts., Rs. 8,32,019; From Korea: Ashoka Insulations, 12,000 Kgs., Rs. 3,74,863; Blow Plast Ltd., 34 Mts., Rs. 7,76,165; B.M. Plastochem, 17 Mts., Rs. 3,53,308; Bombay Traders, 17 Mts., Rs. 3,52,919; Gupta Plastic Udyog, 17 Mts., Rs. 3,72,059; Nik Polymers International, 8 Mts., Rs. 1,82,185; Nathen Packaging Group, 12 Mts., Rs. 3,80,864; Plasto Trades, 17 Mts., Rs. 3,53,888; Varsha Poly Products Pvt. Ltd., 17 Mts., Rs. 3,53,258; From Singapore: Aditya Plastics, 3.725 Mts., Rs. 77,236; From Germany: Super Chemifix Pvt. Ltd., 2,000 Kgs., Rs. 2,92,240.

PVC RESIN: From Brazil: The Bharat Vijay Mills Ltd., 100 Mts., Rs. 15,89,978; Billion Plastics Pvt. Ltd., 63 Mts., Rs. 9,99,766; Gaurav Agroplast Pvt. Ltd., 25 Mts., Rs. 3,97,105; Geeta Devices Pvt. Ltd., 60 Mts., Rs. 9,61,450; Kundalia Industries, 120 Mts., Rs. 19,04,530; Marvel Vinyls Ltd., 100 Mts., Rs. 17,06,326; Rigidar Plastics Pvt. Ltd., 18 Mts., Rs. 2,86,048; Trimurti Foods & Pharma Limited,

125 Mts., Rs. 19,86,267; From Korea: Cannon Steels Pvt. Ltd., 135Mts., Rs. 23,40,472; Devangi Inds., 12 Mts., Rs. 3,21,073: Jayantilal Mangaldas & Sons, 16 Mts., Rs. 2,46,392; From Mexico: Oswal Cable Products, 50 Mts., Rs. 12,62,282; From USA: Ganesh Narayan & Sons, 17.5 Mts., Rs. 2,61,372; Pittie Ferro Alloys Corpn., 75 Mts., Rs. 9,85,044; Pittie Steels P. Ltd., 50 Mts., Rs. 6,56,696.

MATERIALS IMPORTED BOMBAY (16.4.92)

ACRYLAMIDE: From Japan: Kamdar Inds., 7,500 Kgs., Rs. 28,836; Polyelectrolyte India Ltd., 8,000 Kgs., Rs. 2,73,186; Tirupati International, 12.500 Kgs., Rs. 4,80,600.

ACRYLIC ACID: From Japan: Arofine Polymers P. Ltd., 5,200 Kgs., Rs. 1,69,171; Heavy Chemical Corpn., 16,000 Kgs., Rs. 5,15,794.

ALDEHYDE C-9: From UK: Quest International India Ltd., 10 Kgs., Rs. 4,229.

ALDEHYDE 13: From UK: Quest International Ltd., 15 Kgs., Rs. 13,434.

ALLYL HEPTANOATE: From UK: Quest International India Ltd., 50 Kgs., Rs. 12,555.

ATRAZINE TECH: From Israel: Northern Minerals Ltd., 10,990 Kgs., Rs. 13,16,386; Pesticides India Ltd., 11,025 Kgs., Rs. 13,21,873.

BISPHENOL-A: From USA: C.J. Shah & Co., 19,000 Kgs., Rs. 5,39,017.

1 BROMO 3 CHLORO PROPANE: From Japan: Cipla Ltd., 2,500 Kgs., Rs. 3,80,017.

CARYOPHYLENE: From UK: Quest International India Ltd., 10 Kgs., Rs. 1,723.

CEDRYL ACETATE LIQUID: From UK: Quest International India Ltd., 50 Kgs., Rs. 12,555.

CHLOROPYRIFOS TECH: From UK: Crop Health Products Ltd., 171 Kgs., Rs. 60,36,930.

CHROMOTROPIC ACID: From Germany: Sandoz (India) Ltd., 883 Kgs., Rs. 5,70,963.

CINNAMIC ALCOHOL: From UK: Quest International India Ltd., 15 Kgs., Rs. 3,706.

2 CYANOPYRAZINE: From Japan: Orgo Pharm Chem., 1,600 Kgs., Rs. 14,20,509.

CYCLAMEN ALDEHYDE: From UK: Quest International India Ltd., 17 Kgs., Rs. 10,595.

CYCLOPHENTADECANOLIDE: From UK: Quest International India Ltd., 10 Kgs., Rs. 17,836.

DIMETHYL ISOPROPANOLAMINE: From Germany: Amol Drug Pharma Pvt. Ltd., 2,200 Kgs., Rs. 3,97,447.

DIPHENYLMETHANE DIISOCYANATE: From USA: Godrej & Boyce Mfg. Co. Ltd., 203.500 Mts., Rs. 96,95,047.

DL 2 AMINO-BUTANOL: From Germany: Themis Chemicals Ltd., 15,210 Kgs., Rs. 42,24,016.

EPICHLOROHYDRINE: From Germany: Elec. Controls & Systems, 4,140 Kgs., Rs. 1,71,123; Thermoelectric Polymers P. Ltd., 4,140 Kgs., Rs. 1,61,623.

ETHYLENE GLYCOL: From USA: ICI India Ltd., 13,536 Kgs., Rs. 4,50,374.

EUGENOL CRUDE: From Indonesia: Riṣhabh & Co., 600 Kgs., Rs. 64,529.

EUGENOL: From UK: Quest International India Ltd., 370 Kgs., Rs. 67,706.

EUGENOL ACETATE: From UK: Quest International India Ltd., 15 Kgs., Rs. 5,718.

FORMAMIDE: From Germany: Geoffrey Manners Co. Ltd., 18.400 Mts., Rs. 10,26,056.

FURFURYL ALCOHOL: From Belgium: Leo Dye Chem, 2,160 Kgs., Rs. 1,16,586.

HEXAMETHYLENE DIAMINE ADIPATE: From Germany: Garware Polymers P. Ltd., 17,500 Kgs., Rs. 11,44,122.

HEXAMETHYLENE DIAMINE: From Japan: J.K. Synthetics Ltd., 1,120 Kgs., Rs. 1,81,597.

3 HYDROXY QUINALDINE 4 CARBOXYLIC ACID: From Germany: B.R. Industries, 480 Kgs., Rs. 4,26,864; Vipan Industries, 480 Kgs., Rs. 4,17,320.

INDOLE: From UK: Quest International India Ltd., 3 Kgs., Rs. 2,961.

ISOPHORONE: From Italy: Aroma Agencies, 15.2 Mts., Rs. 6,06,887.

ISOPHTHALIC ACID: From Belgium: Skyland Chemicals Pvt. Ltd., 2,000 Kgs., Rs. 2,68,385.

LIGNIN SULPHONATE: From UAE: Roffe Constructions Chemicals 15,250 Kgs., Rs. 1,04,702.

LINALOOL: From UK: Quest International India Ltd., 200 Kgs., Rs. 46,967.

LITHIUM CARBONATE: From Yugoslovia: Torrent Laboratories Ltd., 1,500 Kgs., Rs. 6,01,544.

MALTOL: From UK: Quest International India Ltd., 10 Kgs., Rs. 32,369.

METHYL SALICYLATE: From UK: Quest International India Ltd., 2,000 Kgs., Rs. 2,68,385.

MOLYBDENUM OXIDE: From USA: Chemico Chem Pvt. Ltd., 20.400 Mts., Rs. 19,39,188.

NAPHTHALENE CRUDE: From Canada: Arbuda Chemicals, 15.6 Mts., Rs. 2,22,962; Gama Exports Pvt. Ltd., 15.6 Mts., Rs. 2,22,962; Popular Chemicals Co., 31.2 Mts., Rs. 4,33,694.

PHENYL ACETALDEHYDE DIMETHYL ACETAL: From UK: Quest International India Ltd., 25 Kgs., Rs. 7,752.

POLYETHYLENE WAX: From USA: Paramount Dyes & Chemicals Pvt. Ltd., 15,000 Kgs., Rs. 5,12,224.

POLYVINYL ALCOHOL: From Japan: Hetampuria Textiles, 17,000 Kgs., Rs. 9,05,008; JCT Electronics Ltd., 260 Kgs., Rs. 51,581; Mafatlal Dyes & Chemicals Ltd., 13,000 Kgs., Rs. 7,49,736.

POTASSIUM CHLORIDE: From Singapore: Indian Dyestuff Inds. Ltd., 60,000 Kgs., Rs. 3,77,974.

SODIUM BORATE CRUDE: From Turkey: Aditya Borax Pvt. Ltd., 100 Mts., Rs. 11,52,329; Ferro Coatings & Colours Ltd., 100 Mts., Rs. 11,83,411; Gujarat Small Inds., 100 Mts., Rs. 12,12,901; Neutral Glass & Allied Inds., 500 Mts., Rs. 59,73,795.

SODA ASH: From UAE: Roffe Constructions Chemicals, 500 Kgs., Rs. 16,269.

STYRENE: From UAE: Roffe Constructions Chemicals, 5,000 Kgs., Rs. 34,684.

TITANIUM DIOXIDE: From USA: Plastichemix Industries, 15 Mts., Rs. 7,09,810; R.P. Shah & Sons, 8,000 Kgs., Rs. 3,78,565.

TOLUENE DIISOCYANATE: From Germany: Goodlass Nerolac Paints Ltd., 1,000 Kgs., Rs. 73,938; From USA: Krupa Trading, 19,000 Kgs., Rs. 11,23,865.

TRIMELLITIC ANHYDRIDE: From USA: Atlas Wires Ltd., 3 Mts., Rs. 24,444.

DRUG MATERIALS IMPORTED BOMBAY (16.4.92)

D-PANTHENOL USP: From Japan: Raw Pharma, 500 Kgs., Rs. 3,58,601.

SULPHADOXINE BP 88: From China: Torrent Laboratories Ltd., 700 Kgs., Rs. 7,29,985.

PLASTIC MATERIALS IMPORTED BOMBAY (16.4.92)

LDPE: From Canada: D.S. Mehta & Co., 50 Mts., Rs. 8,57,548; From USA: Associated Plastic Inds., 40 Mts., Rs. 6,83,100.

LLDPE: From Canada: Mafatlal Industries Ltd., 16 Mts., Rs. 4,25,886; From Saudi Arabia: The Bharat Vijay Mills Ltd., 198 Mts., Rs. 45,90,736.

HDPE: From Canada: Associated Inds., 17.500 Mts., Rs. 3,31,245; From Korea: Ador Poly-Containers Ltd., 48 Mts., Rs. 12,25,226; APA Packaging Pvt. Ltd., 64,000 Kgs., Rs. 14,06,240; Associated Plastic Inds., 24 Mts., Rs. 5,27,217; Hind Exim, 8 Mts., Rs. 1,73,200; Jai Fibres Ltd., 64 Mts., Rs. 14,87,493; Kailashchand S. Kumar Plast P. Ltd., 32 Mts., Rs. 6,54,836; Mahalchand Motilal Kothari & Co., 32 Mts., Rs. 6,55,140; Mehta Traders, 24 Mts., Rs. 4,91,118; M.J. Exports, 16 Mts., Rs. 3,78,499; Modern Polyplast 16 Mts., Rs. 3,51,482; Naman Plastics Processor P. Ltd., 16 Mts., Rs. 3,75,126; Niyati Corpn., 32 Mts., Rs. 6,75,494; Pankaj Petropack P. Ltd., 32 Mts., Rs. 7,34,388; Polychroic Industries, 16 Mts., Rs. 1,27,414; Saraf Impex, 80,000 Kgs., Rs. 16,37,845; Sephaire Chemicals, 32,000 Kgs., Rs. 7,02,582; Shanti Enterprises, 16 Mts., Rs. 3,51,169; Sun Export Corpn., 16 Mts., Rs. 3,51,482; Union Quality Plastics P. Ltd., 48 Mts., Rs. 13,68,308; From Saudi Arabia: G.N. Plastopack, 17.150 Mts., Rs. 3,90,558; ITC Agro Tech Ltd., 34,300 Kgs., Rs. 8,38,340; Unilite Inds., 17.150 Mts., Rs. 3,94,908; From USA: Associated Plastic Inds., 50,000 Kgs., Rs. 9,35,105; New Horizon Office Convenience, 10 Mts., Rs. 19,224, Pushpa Impex P. Ltd., 17.500 Mts., Rs. 3,26,068.

POLYPROPYLENE: From Belgium: Ishwar Arts, 30 Mts., Rs. 6,21,084; From Brazil: Borana Plastics P. Ltd., 50 Mts., Rs. 10,09,860; B.R. Enterprises, 18 Mts., Rs. 3,63,008; Delta Ltd., 27 Mts., Rs. 5,86,482; Ellora Chemical Works, 18 Mts., Rs. 3,61,394; Hind Polymers, 18 Mts., Rs. 3,62,984; Jyemko, 20 Mts., Rs. 3,92,040; Midland Plastics Ltd., 100 Mts., Rs. 21,04,560; Naresh Traders, 18 Mts., Rs. 3,73,684; Nidhi Plastics Pvt. Ltd., 100 Mts., Rs. 19,39,575; Plasto Paradise, 80 Mts., Rs. 16,86,272; Polychroic Industries, 9 Mts., Rs. 1,81,536; Shebro Manufacturing Co., 27 Mts., Rs. 5,18,649; Tulsyan Synthetics P. Ltd., 64,000 Kgs., Rs. 12,53,86.

POLYPROPYLENE: From France: Kay Polyplast Ltd., 32 Mts., Rs. 6,53,025; From Korea: Jhaveri Polymers P. Ltd., 48 Mts., Rs. 9,61,874; Ranebo Synthetics & Inds., 16 Mts., Rs. 3,54,872; From Thailand: Narendra Polyplast, 36.16 Mts., Rs. 11,14,644.

POLYSTYRENE: From Japan: Hirachand & Co., 42.5 Mts., Rs. 8,79,865; JCT Electronic Ltd., 1,600 Kgs., Rs. 2,29,100; Unilite House, 17 Mts., Rs. 3,51,947; Unilite Inds., 25.5 Mts., Rs. 5,27,921; From Korea: Borana Plastics P. Ltd., 34 Mts., Rs. 7,07,296; Gold Plast India P. Ltd., 17 Mts., Rs. 3,83,588; Kelvinator of India Ltd., 102 Mts., Rs. 24,94,509.

POLYSTYRENE RESIN: From Korea: Peico Electronics & Electric, 51 Mts., Rs. 11,16,176; From Korea: Plasto Trades, 17 Mts., Rs. 3,84,056; Pushpak Plastics P. Ltd., 85 Mts., Rs. 17,66,290.

PVC RESIN: From Brazil: Caprihans India Ltd., 300 Mts., Rs. 53,17,205; Kundalia Industries, 60 Mts., Rs. 9,52,265; PCL Enterprises Ltd., 25 Mts., Rs. 3,97,042; Rigidar Plastics Pvt. Ltd., 18 Mts., Rs. 2,86,083; From Greece: Accurate Extrusions, 50 Mts., Rs. 7,57,500; Uniplas India Ltd., 49 Mts., Rs. 7,39,089.

POLYVINYL CHLORIDE: From Korea: Amar Plastics, 68 Mts., Rs. 10,91,645.

PVC RESIN: From Korea: Jayantilal Mangaldas & Sons, 16 Mts., Rs. 2,46,392; Omniplast Bombay P. Ltd., 17 Mts., Rs. 2,77,571; The Supreme Inds. Ltd., 170 Mts., Rs. 27,22,002; Urethane Coaters P. Ltd., 32 Mts., Rs. 5,22,404; From Mexico: M.G. Polymers, 104 Mts., Rs. 16,33,490; From Sweden: Vindhya Telelinks Ltd., 1,570 Kgs., Rs. 79,423; From USA: Ganesh Narayan & Sons, 35 Mts., Rs. 5,22,744; Pittie Ferro Alloys Corpn., 125 Mts., Rs. 16,41,740; Pittie Steels P. Ltd., 25 Mts., Rs. 3,28,348.

MATERIALS IMPORTED BOMBAY (From 21.4.92 To 23.4.92)

ACRONAL: From Germany: Cibatul Ltd., 660 Kgs., Rs. 87,569.

ACRYLAMIDE: From Japan: Chemoplast, 15,000 Kgs., Rs. 5,76,720; Inter Dye Industries, 15,000 Kgs., Rs. 6,19,340; Sharda Textile Mills (India), 5,000 Kgs., Rs. 2,06,447.

AEROSIL 200: From Belgium: Khandelwal Laboratories Ltd., 500 Kgs., Rs. 12,15,578.

ALUMINIUM OXIDE: From USA: Grindwell Norton Ltd., 4,191 Kgs., Rs. 3,84,796.

AMINO ANISIC ACID: From Germany: Pidilite Inds. Ltd., 1,200 Kgs., Rs. 10,38,363.

AMMONIA: From Malaysia: Mittal Meditex Pvt. Ltd., 49.2 Mts., Rs. 10,70,409.

AMYL ALCOHOL: From USA: Ballarpur Industries Ltd., 1,03,419 Kgs., Rs. 37,11,702.

ANTIOXIDANT: From Taiwan: Polychem Ltd., 1,000 Kgs., Rs. 1,62,665.

AROMATIC CHEMICALS: From Japan: Industrial Perfumes Ltd., 4,930 Kgs., Rs. 7,57,579; Seth Brothers Perfumers Pvt. Ltd., 776 Kgs., Rs. 2,11,559.

BETA PICOLINE: From Belgium: Glaxo India Ltd., 14,440 Kgs., Rs. 16,73,995.

BUTYL ACRYLATE MONOMER: From Japan: C.J. Shah and Co., 8,460 Kgs., Rs. 2,88,850; From Korea: Colour Chem Ltd., 14,400 Kgs., Rs. 4,84,285.

BUTYLATED HYDROXY ANISOLE: From Japan: Bharat Jyoti, 250 Kgs., Rs. 1,01,788.

BUTYL DIGLYCIDYL ETHER: From Japan: Cibatul Ltd., 720 Kgs., Rs. 1,02,906.

BUTYL GLYCOL: From Germany: Shreeji Enterprises, 14,800 Kgs., Rs. 4,12,653.

BUTENEDIOL: From Germany: Kubo Combustion Efficiency, 295 Kgs., Rs. 45,370.

CAPROLACTAM: From Bulgaria: Nirlon Ltd., 270 Mts., Rs. 1,22,48,954; From Netherlands: Century Enka Ltd., 2,88,000 Kgs., Rs. 1,46,35,472.

CARBON BLACK: From Germany: Rally Paints (India), 3,360 Kgs., Rs. 1,69,605; From USA: Prakash Industries Ltd., 1.965 Mts., Rs. 7,14,737.

CARYOPHYLENE MIN 99%: From Indonesia: Clovex Aromatics, 950 Kgs., Rs. 32,876.

CEDRYL METHYL ETHER: From Netherlands: Keva Fragrances Ltd., 25 Kgs., Rs. 38,771.

CELLULOSE POWDER: From Japan: Cadila Laboratories Ltd., 1,020 Kgs., Rs. 1,72,733.

CETYL ALCOHOL: From Germany: Paras Trading Co., 2,000 Kgs., Rs. 1,00,520.

CHLORDANE: From USA: Rallis India Ltd., 5,031 Kgs., Rs. 9,42,911.

R–CHLORO-2-6 DIETHYL-N-BUTOXY METHYLACETANILIDE TECH 92%: From USA: Monsanto Chem Ltd., 3,72,520 Kgs., Rs. 1,68,57,240.

3-CHLORO-4-FLUORO ANILINE: From China: Ranbaxy Labs. Ltd., 3,000 Kgs., Rs. 16,19,611.

CHLOROPRENE SYNTHETIC RUBBER: From Japan: Jyoti Foam P. Ltd., 3,000 Kgs., Rs. 2,39,560.

CITRIC ACID: From Hong Kong: Delux Sales Corporation, 57.5 Mts., Rs. 15,30,526.

2 CYANO 4 NITRO ANILINE 96% MIN: From China: Serene Dyestuff Inds., 2,000 Kgs., Rs. 5,32,357.

DANE SALT: From Netherlands: Kopran Ltd., 2,000 Kgs., Rs. 11,29,780.

2,6 DIETHYL ANILINE 98% PURITY MIN: From Switzerland: Montari Industries Ltd., 29,640 Kgs., Rs. 24,40,960.

DIETHYL CARBONATE: From France: Ranbaxy Laboratories Ltd., 5,040 Kgs., Rs. 4,71,135.

DIETHYL DIAMINE 62%-68%: From Sweden: Santosh Pharmaceuticals, 9.139 Mts., Rs. 14,47,554.

DIMETHYLAMINO ETHYL METHACRYLATE: From Germany: Pidilite Inds. Ltd., 180 Kgs., Rs. 30,586.

DIMETHYL FORMAMIDE: From USA: Indian Petrochemical Corpn. Ltd., 98,865 Kgs., Rs. 30,76,677.

DIPHENYL OXIDE: From USA: Anand Lescuyer Polymers Ltd., 300 Kgs., Rs. 90,624.

EPICHLOROHYDRIN: From Germany: Nisha Chemicals, 16,560 Kgs., Rs. 6,94,270.

2 ETHYL ANTHRAQUINONE: From Japan: National Peroxide Ltd., 5,000 Kgs., Rs. 27,94,876.

ETHYLENE ACRYLIC ACID: From USA: Essel Packaging Ltd., 4,875 Kgs., Rs. 3,02,803; From USA: Mafatlal Inds. Ltd., 4 Mts., Rs. 2,95,754.

2-ETHYL HEXANOIC ACID: From USA: Alpha Chemie, 26,784 Kgs., Rs. 9,65,529.

FURFURYL ALCOHOL: From Belgium: Jadavji & Co., 1,920 Kgs., Rs. 1,05,052.

GAMMA FERRIC OXIDE: From Japan: Straw Products Ltd., 16,000 Kgs., Rs. 13,95,959.

GUM RESINS: From USA: Nav Bharat Inds. Linings, 55 Lbs., Rs. 19,555.

HEXYLENE GLYCOL: From UK: Sandoz (India) Ltd., 5,130 Kgs., Rs. 2,53,500.

HYDROXY PROPYL METHYL CELLULOSE: From UK: Indo German Laboratories, 500 Kgs., Rs. 2,51,610.

IODINE CRUDE: From Japan: Lub Chem, 1,000 Kgs., Rs. 3,04,331.

ISOCYANATE: From Germany: Milton Plastics, 8.250 Mts., Rs. 4,39,195.

ISOPROPYL ALCOHOL: From China: Bhoruka Drum & Inds. P. Ltd., 100 Pcs., Rs. 24.

LABORATORY CHEMICALS: From Germany: Seventilal Mahasekhlal & Co., 180 Kgs., Rs. 2,12,861.

LAURYL ALCOHOL: From USA: Hico Product Ltd., 13,290 Kgs., Rs. 5,01,148.

L-BASE (ACTIVE AMINODIOL): From China: Themis Agencies, 1,000 Kgs., Rs. 24,84,662.

LITHIUM CARBONATE: From USA: Neogen Chemicals P. Ltd., 2,500 Kgs., Rs. 3,58,106.

LITHIUM HYDROXIDE MONOHYDRIDE: From China: Tide Water Oil Co. (India), 8,000 Kgs., Rs. 11,17,989.

LITHIUM HYDROXIDE MONOHYDRATE: From Hong Kong: Castrol India Ltd., 17.500 Mts., Rs. 21,50,861; From USA: Neogen Chemicals P. Ltd., 200 Kgs., Rs. 32,841.

LITHOPHONE: From China: Mangla Trading Co., 21,000 Kgs., Rs. 2,20,104.

MAGNESIUM OXIDE POWDER: From Germany: Rashmi Heaters P. Ltd., 3,109 Kgs., Rs. 1,78,676.

MERCURY: From Algeria: L.S. Chemicals & Pharmaceuticals, 3,450 Kgs., Rs. 3,72,650.

MONOETHYLENE GLYCOL: From Saudi Arabia: Century Enka Ltd., 1049.732 Mts., Rs. 1,37,28,460.

4-MORPHOLINYL BENZOTHIAZOLE: From USA: Goodyear India Ltd., 2,267 Kgs., Rs. 3,55,556.

NAPHTHALENE CRUDE: From France: Zenith Ltd., 61.975 Mts., Rs. 8,95,617; From Japan: Sajjan Impex Ltd., 1,28,000 Kgs., Rs. 9,98,822.

NAPHTHENIC ACID: From Belgium: Bharat Petroleum Corpn. Ltd., 7,980 Mts., Rs. 4,08,854.

OLEYL CETYL ALCOHOL: From Germany: ICI India Ltd., 13.600 Mts., Rs. 4,54,676.

PALM ACID OIL: From Malaysia: Prema Enterprises, 17,900 Kgs., Rs. 1,54,374.

PARA CHLORO TOLUENE: From USA: Gujarat Insecticides Ltd., 29,393 Kgs., Rs. 12,76,030.

PARAXYLENE: From Japan: The Bombay Dyeing & Co. Ltd., 4966.256 Mts., Rs. 6,54,34,510.

PEPPERMINT: From UK: Quest International India, 1,200 Kgs., Rs. 16,48,178.

PERCHLORIC ACID 70%: From Germany: Scientific Products, 150 Ltrs., Rs. 1,03,836.

PHENYL ETHYL DIMETHYL CARBINOL: From Netherlands: Keva Fragrances Ltd., 50 Kgs., Rs. 37,983.

POLYACRYLIC ACID: From USA: Tandon Enterprises, 4,800 Kgs., Rs. 2,89,997.

POLYETHYLENE GLYCOL: From Germany: Shailtex Lubricants P. Ltd., 1,000 Kgs., Rs. 86,220.

POLYSULPHIDE: From UK: OKS Speciality Lubricants P. Ltd., 100 Kgs., Rs. 33,369.

RESORCINOL: From USA: Modi Rubber Ltd., 10,000 Kgs., Rs. 10,90,117.

SILICA PRECIPITATED: From USA: Colgate Palmolive (India) Ltd., 72,576 Kgs., Rs. 32,38,504.

SILICA SAND: From USA: Grindwell Norton Ltd., 1,451 Kgs., Rs. 43,821.

SILICON CARBIDE: From Norway: Grindwell Norton Ltd., 20,000 Kgs., Rs. 9,12,798.

SILICON DIOXIDE: From UK: Mul Health Care Products P. Ltd., 45,000 Kgs., Rs. 28,07,388.

SILICON DIOXIDE HYDRATED: From UK: International Health Care Products, 5 Mts., Rs. 9,35,796.

SILOXANE: From USA: Trichem Enterprises (Bombay) P. Ltd., 1,950 Kgs., Rs. 1,93,201.

SODIUM LAURYL SULPHATE: From France: Colgate Palmolive P. Ltd., 44,000 Kgs., Rs. 24,08,360.

SORBIC ACID: From Japan: Bharat Jyoti, 500 Kgs., Rs. 81,430.

SOYA LECITHIN: From Hong Kong: Letape India P. Ltd., 1,000 Kgs., Rs. 1,92,241.

THIOPHENOL: From USA: Boots Pharmaceuticals Ltd., 600 Kgs., Rs. 1,42,924.

TITANIUM DIOXIDE: From Germany: Petrofils Co-operative Ltd., 17.5 Mts., Rs. 14,23,579; From Japan: Raymond Synthetics Ltd., 7,500 Kgs., Rs. 6,71,206; From UK: Plastika Inds., 10 Mts., Rs. 4,80,600; From UK: Texoplast, 10 Mts., Rs. 4,80,600.

CHEMICAL WEEKLY

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Lasers — a many splendoured tool

ALTHOUGH it was always recognised that the laser had many potential applications in manufacturing engineering, these tended to be overshadowed by its use in advanced research and high technology.

More recently, however, it has been realised that the advantages of lasers in machining, welding, heat treatment, metrology and other shopfloor applications can ensure them a growing place in the engineer's armoury.

United Kingdom designers and manufacturers of laser-based equipment are assisting this trend by offering machines and systems for industrial use while continuing programmes of research and development to ensure a continuing flow of new and advanced products.

Further support has come from Britain's Department of Trade and Industry which has launched the National Laser Technology Transfer Programme with the aim of arousing greater awareness of the commercial benefits of using lasers in material processing.

Machining complex components

A good example of the versatility of the laser is provided by Electrox of Hitchin, near London, which exports over 80 percent of its output to continental Europe and the rest of the world.

Its recently introduced L-1000 1 kW CO_2 laser has been designed for low cost materials processing in laser job shops engaged in activities that are as varied as sheet metal cutting, engraving, printing industry work, and scribing ceramics, for example, in printed circuit board production. It can cut steel up to 8 mm thick, stainless steel up to 5 mm, and aluminium, and is easy to operate, service and maintain.

As an illustration of laser versatility, the L-1000 can be switched automatically and instantly between continuous, pulsed and super-pulsed power. This facility enables a complex component to be machined by using continuous power for straight line sections, pulsing to reduce burning on sharp corners and super-pulsing for clean cuts on thicker areas.

Another recent product is the Electrox MCL-1500, specifically designed for metal cutting and capable of handling mild steel up to 12 mm and armour plate to 16 mm thick. Its most advanced feature is programmable pulse generation, permitting a variety of metals to be processed in succession and reducing the amount of downtime required for resetting the laser.

New dual laser

A new dual laser has been introduced for the sheet metal industry, enabling two components to be profiled in a sheet in one set-up without repositioning. It differs from most other dual systems in that it uses separately generated laser beams instead of splitting a single beam. This can result in loss of power and accuracy through contamination and overheating.

A good example of the increased productivity laser machining can provide come from the Amchem Company of Loughborough, in the English midlands, a leading supplier of complete turnkey manufacturing systems incorporating laser technology.

One of its laser machining centres has been sold to General Electric of the United States. It features nine axes of control, including the laser trepanner, and is designed to drill thousands of very small holes in effusion combusters.

A special feature of this machine is the incorporation of Amchem's own version of the drilling-on-the-fly (DOTF) process in which the firing of the laser pulse is automatically synchronised to the motion of the workpiece, which is rotated at constant speed. This DOTF variant differs from other systems by ensuring a high

level of flexibility in hole pattern and depth, offering substantial productivity increases by eliminating the need to index the component. Advantages of using the machining centre include much faster operation, positioning repeatability to within 5 micrometres, very high levels of accuracy, good repeatability, burr-free machining, and high quality of surface finish.

It has permitted the manufacturer to introduce a new modular method of producing transmission trains, enabiling a typical assembly involving welds up to 75 mm in circumference to be completed in seconds. Two independently operated CO_2 2.5 kW lasers are directed through gantry rails above two component transfer lines and a carousel equipped with see-sawing jigs. Using moving optics, the lasers are directed accurately above the workpieces which, during the welding process, are rotated at a fixed speed.

To accommodate the different workpieces, the welding heads are moved vertically by ball screw cylinders. Programs for more than 20 different assembly operations are stored in the computer numerical control (CNC) system.

Complete package procedure

This installation is a good example of the ease with which laser-based equipment can be incorporated in complete production lines. For example, during production, the tranfer lines are used to feed the lasers with workpieces mounted on mandrels. Then, when the gear assembly is complete, a shaft is inserted and the final welding is performed on the carousel jigs. Other operations carried out by the package take the transmission trains from the degreasing of the components right through to semi-automated testing.

Although the laser was slow to make an impact in general manufacturing, it has become an expanding sector that includes a number of companies established to develop the technology during the past few years. Quantum Laser Engineering of Coventry, in the English midlands, was set up five years ago to design to specific requirements, develop and produce advanced, competitive laser systems. Its range includes the Quantum Surecut laser making system, based on a CO_2 laser. Key features include a design that ensure the laser output beam never passes over supports, eliminating the possibility of marks on the cut edges.

Quantum Marker is a 65 W Nd-YAG solid-state laser, computer controlled marking machine, with variable writing speeds from zero to 250 mm/s that produces logos, alpha-numerics or bar codes on a wide range of components and materials. It can serve either as a stand alone machine, a semi-or fully automatic load/unload systems, or as a unit integrated into a production line or automated cell.

Specials can be built to suit individual requirements. Recent examples include a gas cutting laser for trimming microwave oven doors as part of an integrated production line and a solid-state laser welding system for precision welding automotive potentiometer wipers.

Now firmly established as a recognised manufacturing tool, the industrial laser can anticipate a bright future in which United Kingdom manufacturers of laser-based machines and systems are looking to play a significant role.

Laser takes car industry by storm

Lasers are now accepted workshop tools, established in an ever widening spectrum of industriiial applications. They have many advantages compared with conventional cutting tools, working fast on sometimes complex shapes, and can be used for drilling, welding, scribing and heat treatment too. As non-contact tools they suffer no wear or breakage and there is no need to stop production for grinding or sharpening. Cutting without distortion of material, lasers produce narrow kert widths, and heat affected zones are minimal. By equivalent energy comparisons, industrial lasers use energy more efficiently than most conventional processes. Waste material is reduced and often fewer finishing operations are required. They are also playing an increasingly important role in production line technology and are easily integrated into automated plant systems.

Laser tools require little fixturing, the beam is easily monitored and controlled, and the lightweight focusing head can be manipulated to minimise movement of the component. They do not require special environments, such as vacuum chambers, and are as safe and reliable as a conventional machine tool. These advantages can provide considerable cost savings and increases workshop efficiency. The latest in industrial application is the MF 400 laser with its multifold tube designed for compactness and light weight. Of rugged construction, it holds its alignment even in vibrating environments. The electrical circuitry is simple, with a single, reliable high voltage circuit, designed for easy servicing.

The MF 400 forms the heart of a Robolaser advanced laser cell, designed and installed by Futurologic Industrielle Automation GmbH at Volkswagen in Wolfsburg,

West Germany. So successful has been the first Robolaser that a second installation has been commissioned. Before the installation of the first system, every car passing through the production process was cut to enable it to accept all variations of equipment such as righthand drive, positioning of exhausts and antennas, irrespective of whether the individual car was destined for the United Kingdom or other markets. Each unused opening then had to be plugged.

The last system now cuts the ventilation opening for the 15 per cent of car bodies with right-hand drive. The cutting process, performed on-line, takes just a few seconds and the body is in the cell for only 52 seconds to allow for the sophisticated array of sensors and interlocks to locate the cutting head. Weighing only 137 lbs, the MF 400 laser is sufficiently strong in construction to allow its mounting on the robot platform itself, considerably simplifying laser beam delivery. The system has allowed Volkswagen to maintain a cutting speed of 16ft 5in/min with production uptime of some 95 per cent minimum over six three-shift days per week.

Laser dissolves blood clot

University of Miami doctors stopped a heart attack in progress by threading a laser catheter through the victim's arteries and disintegrating the fatty deposit that had blocked the flow of blood in a coronary artery. The case, involving a 56-year-old Hialcah man, is the first known instance where the clot-dissolving technique was used during an actual heart attack, doctors said.

The University of Miami, affiliated with Jackson Memorial Hospital, is one of 30 medical centres nationwide testing the use of lasers to clear blocked arteries. The techniques involves homium laser energy, pulses of concentrated light that disintegrate fatty deposits without damaging surrounding tissue. University of Miami doctors have used it on 21 patients in the last year in an attempt to ward off heart attacks.

But it was too late for prevention when Carlos Baba arrived at Jackson's emergency room on October, 3 suffering chest pains. An X-ray showed blockage in a heart artery. The preferred treatment in such cases is to administer a clot-dissolving drug such as TPA. That was ruled out for Baba because he suffered a stroke in May.

Dr. Eduardo Demarchena, Director of interventional cardiology for the UM School of Medicine, threaded the laser catheter into an artery in Baba's leg and up through his chest, monitoring the blood flow on a video screen. He used blasts of intense energy from the laser to clear the blocked passage, instantly restoring blood flow to the vessel.

Laser therapy is being increasingly accepted as the safest, simplest, and least invasive method of treating kidney stones. In an operation that takes just a little over half an hour, doctors insert a hair-thin optical fiber that releases a burst of energy, which breaks the stone but leaves the surrounding tissue unharmed.

Doctors are increasingly turning to lasers to treat a painful and common ailment — kidney stones. The procedure, which was approved by the U.S. Food and Drug Administration (FDA) in 1986, has grown rapidly in use and is now one of the most common methods of treating stones in the lower ureter, the narrow passage-way between the kidney and the bladder.

While just a few hundred of the more than 350,000 cases of kidney stones in the United States were treated with the laser when it was first introduced, nearly 25,000 kidney stone patients received the therapy just two years later-in 1988. Indeed, the treatment has been so successful that the FDA approved a similar procedure for a similar ailment, gallstones, although scientists are divided over whether it will be as effective against gallstones.

The use of lasers in medicine has grown rapidly in recent years, and doctors are experimenting with the devices in a wide variety of procedures, like opening blocked coronary arteries and reshaping the cornea of the eye to correct poor vision. Lasers have also been used experimentally to close surgical wounds and to treat certain types of tumors.

Recent studies also indicate that lasers are effective in removing certain types of birthmaks on the skin, as well as tattoos. The therapy for kidney stones is one of the most advanced and widely employed procedures involving medical laser technology, scientists say.

To treat kidney stones, a doctor inserts a hair-thin optical fiber into the patient's ureter until it reaches the stones. The laser is then triggered, releasing a burst of energy in the form of green light that breaks up the stone but leaves the surrounding tissue unharmed. Many kidney specialists say laser therapy is the safest, simplest, and least invasive method of treating stones in the lower ureter. About 20 per cent of kidney stone cases involve stones in this area.

"With this method, we can get access to stones we could not see before," says Stephen P. Dretler, a uro-

logist at Massachusetts General Hospital who helped develop the laser technique there in 1986. About 180 hospitals around the world now have laser machines, which can cost up to $200,000 each. Kidney stones, often excruciatingly painful, develop in the kidneys or urinary tract, where the largest can block flow.

After laser impulses are transmitted through the optic fiber and smash the stone, the pieces are then either passed through the urine or pulled out using a miniature basket inserted through a catheter. The entire procedure takes about 35 minutes and requires a hospital stay of just two to three days.

When kidney stones cannot be passed without treatment, the most common therapies are now lithotripsy and percutaneous stone removal. In lithotripsy, a device generates shock waves outside the body. The shocks, which are focused on the kidneys, break up the stones. In the percutaneous procedure, an endoscope is inserted through a small incision. The stone is either pulled out if it is small enough, or a shock wave is delivered at pointblank range to smash the stone.

But percutaneous removal is often inappropriate for stones in the lower ureter because it requires the use of a thick endoscope, which can damage the narrow walls of the passageway, says Ernest R. Sosa, a urologist at New York Hospital who performs about 100 kidney laser treatments annually. In addition, kidney stones in the lower ureter, below the waist, are difficult to treat through lithotripsy. Their location behind the bones of the pelvis requires a surgeon to manipulate the stones with an instrument before performing lithotripsy.

Some doctors have also raised the possibility that shock waves generated in lithotripsy may damage the kidneys and lead to high blood pressure. There is no evidence that laser can cause a similar problem, doctors say. Surgical removal of kidney stones, the most popular treatment until 1986, now occurs in less than five percent of kidney stone cases, and primarily in those with large or infected stones.

Laser treatment is regarded as safer than the other invasive procedures because it emits a green light that is absorbed only by the stone and not the surrounding tissue, Dretler says. Because the stones absorb frequencies of light different from those absorbed by the walls of the ureter, any laser impulses that do not make contact with the stones will not cause unintended damage.

The use of lasers in gall bladder therapy is newer and its usefulness less certain. Some doctors say it is viable option for less than one percent of all gallston patients, and it may prove harmful to some who pos pone removal of the gall bladder. Johnson L. Thistle, gallstone specialist at the Mayo Clinic in Rochester, Mir nesota, says the treatment works, "but considering th other options, the frequency of its use is too low t become enthusiastic about it."

Gallstones can inflame the gallbladder, a sac tucke under the liver in the upper right abdomen. The gall bladder stores bile made in the liver until it passes int the intestines to aid digestion. More than 75 per cen of gallstone patients in the United States are now treate by surgically removing the gallbladder. Unlike the lase technique the surgical procedure is favoured by many gastroenterologists because it eliminates possible recur rence of the stones. Every year more than 500,00 Americans develop gallstones, made up in most cases of cholesterol or calcium or both. The stones can cause intense pain, nausea, and fever.

A number of non-surgical methods eliminating the stones have been developed over the past few years. For gallstones composed of cholesterol, lithotripsy has been tried. But doctors caution that lithotripsy can produce large fragments that can become stuck in the bile duct, requiring further treatment.

Doctors now also use ether-based drugs that can dissolve the stones within a few hours. This procedure has been limited in use because the drugs can dissolve only stones made of cholesterol.

Physicians who are enthusiastic about laser treatment say it provides an important alternative for elderly and frail people for whom gallstone surgery can pose high risk. "This is a technology that, although limited now, will grow in use," says Robert Hawes, a gallstone specialist at Indiana University Medical Center, which is one of a handful of hospitals now using the laser to destroy gallstones.

Some advantages of the treatment, advocates say, are that it requires a hospital stay of just a few days, compared with four to six weeks for gallbladder surgery. And unlike lithotripsy and dissolving medications, lasers can destroy all gallstones, whether made of calcium or cholesterol, says Hawes, who developed the procedure along with Peter Cotton, a physician at Duke University Medical School in Durham, North Carolina. Hawes has already treated gallstone patients with laser therapy.

— T.P.S. RAJAN

CHEMARENA

S.L. VENKITESWARAN

Du Pont swaps methacrylate for ICI's nylon business

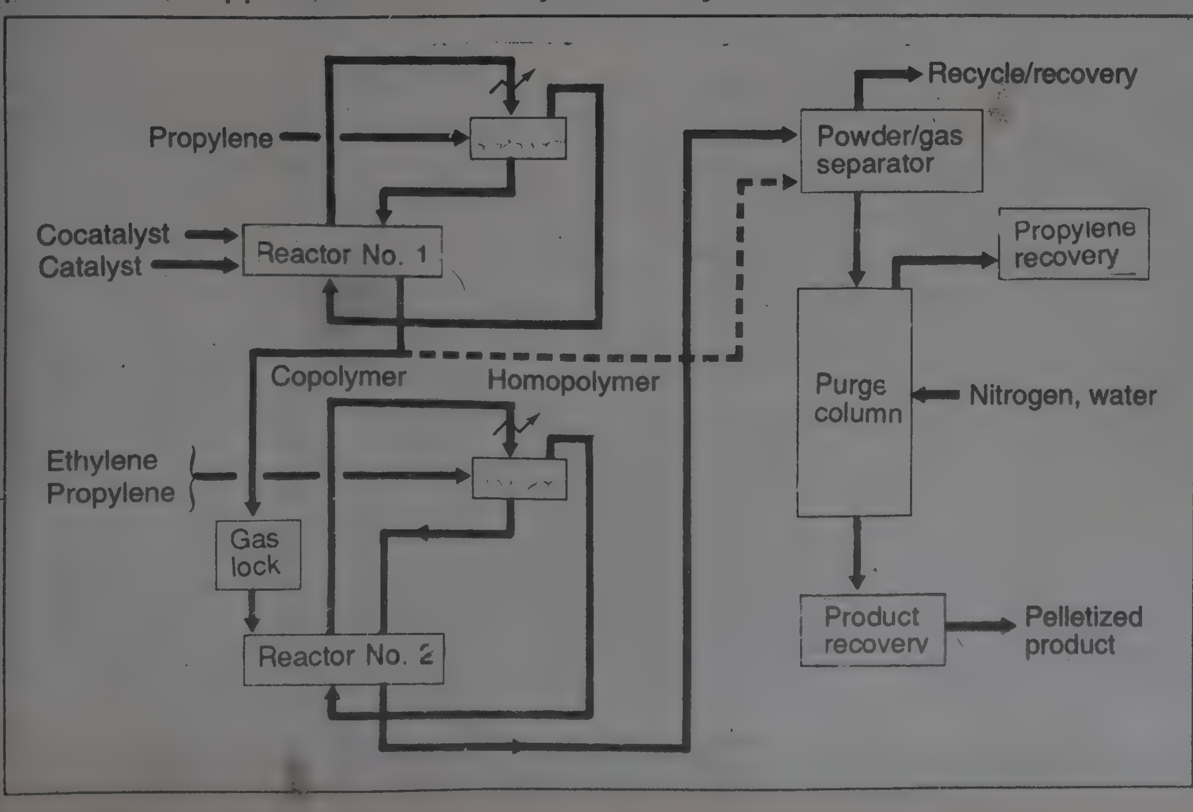
In a bid to retain global supremacy in specific areas Du Pont has quit its methacrylate resins business in a swap with ICI for the latter's nylon business. This makes both stronger in these areas. ICI will take over both the plastics and sheet operation in USA while Du Pont takes over the European nylon operations of ICI. It is reported that Du Pont will pay $430 million as further compensation to cover difference in value of assets. ICI had originally taken a licence for nylon for hosiery from Du Pont in the forties. Du Pont is building up a nylon (66) plant in Singapore which may be its only one outside USA. ICI's sales of nylons were $1 billion and raises Du Pont's sales to $4.5 billion. The nylon intermediates plants of ICI in UK is part of the deal.

ICI gets the methacrylate business worth $300 million in USA and this adds to its efforts to expand in US, UK and Taiwan — total of $ 85 million.

Amoco's new technology for polymerisation

Amoco Chemical is to start up a new ethylene/propylene polymer plant in Texas based on its new technology, which is claimed to be significantly better than the diverse systems in use. The base is a "super high activity catalyst" of proprietory nature and also a unique reactor design. It is a joint effort with Chisso Corporation of Japan. Amoco is said to have developed the homopolymers of ethylene and propylene while Chisso added its expertise in copolymerisation. An outline of the process is given in the figure. (*C.E. News*, 30.3.92)

The catalyst is based on titanium tetrachloride with promoters, supports and co-catalysts. The yields are claimed to be higher per volume catalyst whose particle size is carefully controlled. Metal residues are below 1 ppm level with no need for removal; nor is any solvent used. The catalyst is also chlorine-free and this removes a source of corrosion. A unique feature of this gas phase polymerisation is the ability to control and vary the isotactic index.



Reactor design permits residence time to be varied for a single reactor vessel, instead of having to use a series of vessels. In the case of copolymer grades a second reactor is used. There is a total absence or need of inert solvents or liquid propylene. The heat removal is achieved by evaporation of liquid propylene at a particular point. Gas phase process designs are also developed and used by BASF, ICI, Norchem, Union Carbide and Shell. There is very little combustible liquid material in reactor and hazards are eliminated. Operating costs are lower. Mechanical agitation is used as per Chisso designs. Monomer purification is of course essential to avoid traces of catalyst poisons and the catalyst system is carefully metered and injected at one end. As hold up in reactor is low, grade variations are quickly put through. For homopolymer, only propylene is used while for

random copolymers the controlled amount of co-monomers are injected in the second reactor. Product is periodically discharged, monomer removed, catalyst deactivated, compounded and pelletised. Amoco starts up at a time of glut in market of 10 million tonnes but growth is expected to continue and Amoco's lower costs will help in market share. They expect to license the technology in the high growth areas of South Asia/Pacific.

Phillips' plastics unit on stream again

After a disastrous explosion at the Phillips' Texas complex in 1989 ripped through the largest polyethylene facility in USA — 18% of US capacity for HDPE (and some PP also) — the plants have been rebuilt and geared for restart — but at a time of plenty and mild recession. Phillips have stood by their customers by arranging supplies from their other plants to the extent feasible. HDPE plants operated at a 95% level of capacity when the disaster occurred but are now down to 88% with more capacity around. The newer plants are with lower cost production but Phillips claims to have matched these improvements. They expect to produce 1.2 billion lbs. in 1992, Phillips' view is that for packaging, HDPE is preferred and hence less affected than other plastics.

Phillips have reportedly spent $400 million for the rebuild of the HDPE plant with two trains online and a third to start soon, each of 500 million lbs. Their PP unit was relatively undamaged and also the K-resin plant but had to remain shut for some time. They have been trying to sell off sections such as polyphenylene sulphide and advanced composites to concentrate on the major polyolefines. Another development item — polymethyl pentene is also being shut.

Phillips is very active in recyclings and have a joint venture with Pantek Corporation to help collection, processing and sale. It is expected to sell back nearly 75% of its procurement after processing. They have also started up a new olefines plant in Texas with 1500 million lbs ethylene and 600 million lbs of propylene to feed its polymer units. But it is tough time ahead with a capacity rise of nearly 3 billion pounds by others in US in the intervening two-and-half years. US capacities for HDPE as of 1989 and 1993 (expected) is given in table.

ANNUAL CAPACITY OF HDPE IN U.S.

(million pounds)

	1989	1993
Phillips 66	1550	1800
Exxon-Paxon	1300	1800
Occidental	1270	1710
Quantum Chemical	1750	1690
Solvay Polymers	1160	1440
Chevron	600	1070
Union Carbide	650	900
Dow Chemical	525	600
Hoechst Celanese	350	425
Others	185	960
Total	9340	12395

Himont's newer technical innovations

Himont, the world's top producer of polypropylene and process licensor is on to a wider range in polyolefins. The first new plants by AD 2000 for their new line of polymers under the names "Catalloy", "Hivalloy" and "Spherilene" are to be built to make a wide range of advance polymers. There is the recently completed polypropylene plant in Antwerp, Belgium. A propane dehydrogenation unit (UOP process) in Thailand to feed joint ventures for PP and joint ventures in Mexico and Malaysia besides one with Mitsubishi Gas Chemical (MGC) and Showa Denko in Japan.

"Catalloy" process gives a new kind of polyolefinic material ranging from soft elastomeric to high impact products without the need for a third monomer (EPDM) and all in one reactor — a polyolefinic alloy of PE, PP, polybutene made in the gas phase. 65,000 TPA of advanced technology high-melt, high-strength polymer in Canada is claimed to have an PP grade which can replace expandable polystyrene. Himont claims to have a family of materials combining olefinic monomers and non-olefines ranging from styrene, acrylonitrile and maleic anhydride. This material may cut into the ABS market. The joint venture with MGC is to include glass reinforced PP and a 20,000 TPA polyphenylene ether unit. A catalloy unit is to come up in Japan with Showa Denko.

Himont's foray into polyethylene will be a 200,000 TPA unit in USA — low density linear material and high density PE also. Himont's Spheripol PP capacity is over 2 million tonnes (17% of global capacity), while worldwide it covers 65% of PP capacity. These are the new horizons for world leader Himont in the field of polyolefines.

Trade teams to visit 35 nations to boost export

An ambitious plan has been finalised in coordination with the External Affairs Ministry to send trade delegations to 35 countries, in a major effort to market Indian goods and services in diverse fields, according to **Mr. A.S. Bose,** convenor of the forthcoming 'World Trade Fair' at Hyderabad.

Speaking to reporters at Bombay recently he said all arrangements had been made to despatch the first trade delegation to the USA and Canada early next year to explore export markets there in cooperation with non-resident Indians (NRIs).

European countries had already sent trade delegations to the Gulf states to tie up contracts, while India was yet to make any matching effort, Mr. Bose observed, stressing the need for an Indian trade delegation to tour the Middle East at the earliest.

Mr. Bose said the issue of sending trade delegations would come up at the 'World Trade Fair', organised from January 1 next by professionals in business, industry and commerce in association with Andhra Pradesh government to open up India to foreign collaborations as well as business and industrial opportunities with export orientation.

He said attendance at the international industrial exhibitions held at the Pragati Maidan in New Delhi had been declining 'due to bureaucratic red tape.' The fair would be the first of its kind to be held in south India coinciding with concluding celebrations of the 400th anniversary of Hyderabad city.

It would feature seminars in various thrust areas, besides exposing enterprises from state governments to international export standards. A three-day world NRI conference would commence at Hyderabad from January 11, at the end of the trade fair, he said, adding 175 NRI associations would take part in the meet with substantial participation from the USA, Canada, Gulf states, the UK, France and Southeast Asia.

The fair, being organised at a cost of Rs. 3.5 crores, will comprise an international exhibition held over an area of 180 acre and an international conference with nine separate industry-wise seminars.

CECRI DEVELOPS CHEAP MEMBRANE CELL TECH

In a major technological breakthrough, the Central Electrochemical Research Institute (CECRI) at Karaikudi has indigenously developed state-of-the-art membrane cell technology which is expected to revolutionise the chlor-alkali industry in the country and ensure foreign exchange savings.

Disclosing this to newsmen in Madras recently CECRI director **Dr. S. Rangarajan** said this environmentally-sound and energy-efficient technology, which was a spin-off from fuel cell technology used in the United States space programme, was fast replacing mercury cell technology in the chlor-alkali industry all over the world.

He said foreign process technology vendors had quoted Rs. 54 crore for a 50-tonne-per-day membrane cell plant, whereas the licence fee for the know-how developed by the CECRI worked out to about half the figure. The first plant to manufacture caustic potash based on the new technology would be set up by a private entrepreneur at Sriperumpudur.

ISRAELI FIRM KEEN TO SET UP PROJECTS IN WB

Israeli Chemical Corporation, belonging to one of the largest industria groups based in Tel Aviv, has show interest in setting up a number of pro jects covering chemical, petrochemica and agro-based projects in West Benga

A team from Israel was recently i Calcutta to discuss the project idea with the officials of the Commerce an Industry Ministry. Sources in th Department of Commerce and Industr said the Tel-Aviv group was intereste in putting up a phosphatic fertiliser pro ject at Haldia.

The possibility of involvement of th West Bengal Industrial Developmen Corporation Ltd. (WBIDC) was ver much there although WBIDC had no yet been officially informed about thi matter.

"We have no knowledge about thi Israeli venture", said WBIDC execu tive director **D. Chakraborti.**

SAFE HANDLING OF CHLORINE STRESSED

Pointing out the crucial role of chlorine, an hazardous chemical involved in major accidents, in the field of water purification, pesticides and textiles **Mr. Arun Mehta,** Minister of State fo Labour, Home, Legislature and Cultural Affairs stressed the need to educate people on the issues relating to manufacture, storage, handling and transportation of the chemical.

Inaugurating a two-day seminar on "Chlorine safety", in New Delhi Mr. Mehta underlined the significance of sharing information with workers so that they could recognise the importance of safety operation.

In his address, **Mr. A.S. Mitra,** Managing Director, General Insurance Corporation of India mentioned the introduction of Public Liability Insurance Act which make companies liable to pay compensation for victims affected by chemical related accidents,

Tamil Nadu cancels alcohol permit to tardy units

In a major policy decision, Tamil Nadu government has passed orders cancelling the allotment of alcohol, committed earlier, to alcohol-based units which have not taken steps to executive their project proposals.

Official circles are reluctant to disclose the reasons for the decision. Informed sources attribute it to the long delay on the part of the applicants to utilise the allotment. Some of them got the commitment three years ago. The list of the companies whose allotment has been cancelled is not known immediately. But, it is understood that about 500 lakh litres of alcohol will be available as surplus for fresh allotment.

Welcoming the decision to rescind the allotment, the Chemical Industries Association has urged the government to earmark the supply to pending applicants which have submitted proposals for putting up alcohol-based units. It is said at least 900 lakh litres could be absorbed by the new applicants.

Already four sugar companies, Aruna Sugars, Kothari Sugars, Thiru Arroran Sugars and Rajshree Sugars proposed to set up alcohol-based units for the manufacture of ethyl benzene, ethylene oxide, diketene, acetic acid etc.

Incidently, these four mills have recently got the approvals from the state government to set up distilleries utilising the surplus molasses available captively as well as from other mills. Besides them, EID Parry has a plan to put up a plant for the manufacture of Vinyl acetate monomer. Bharathiya Engineering Corporation of Walchandnagar Group also has a plan to promote a project.

The association also wants the government to meet the small quantity of alcohol required by Encee Aromatics (which has already export orders worth Rs. 3.5 crore for exporting essence out of jasmine flower) and molasses for Godwin Chemicals Ltd. for its oxalic plant. It is said that another small unit has been languishing without supply of small quantity of alcohol for its rice bran oil extraction plant.

POLYURETHANE SYSTEMS FROM SHIVATHENE

The Shivathene Group of Companies last year launched its High Technology Company, Shivathene Linopack Ltd., (SLPL) to manufacture base and formulated polyols for the polyurethane industry in collaboration with N.R.G. PLC., of UK.

The Shivathene group has a turnover in excess of Rs. 100 crores and employ more than 1000 people in the Group. Other products manufactured by the group are polyethylene film, cable sheathing compounds, synthetic detergents and colour concentrate for the plastic industry.

SLPL has a plant capacity of 6000 MTPA of polyol for rigid foams, cable jointing compounds, electronic potting compounds, structural foams and polyurethane coatings for water proofing and corrosion proofing.

An extensive research laboratory and quality control facility form a part of the manufacturing complex of SLPL set up at Parwanoo in the Northern State of Himachal Pradesh. Products from this plant will be sold mainly to the Indian refrigerator industry, casserole/thermoware industry, electricity boards, capacitors, CT & PT manufacturers, fertiliser industry, chemical plants, optic cable manufacturers and the building industry for reinforced dust free floorings.

The products are being sold under the trade name Shivapol. The company also sells polyurethane system under the trade name of Shivabond and Shivanate. The opening of this company is in line with the group strategy of diversification to the field of thermosets after holding a premier position in the field of thermo plastics in the country since the last decade.

The Company had developed a well trained technical service cell which has its representative based at all the company's marketing offices at Parwanoo, New Delhi, Bombay, Madras, Hyderabad and Bangalore.

WORLD TRADE FAIR AT HYDERABAD

The World Trade Fair, an International Exhibition and Conference on Foreign Collaborations, Industrial and Business Opportunities will be held at Hyderabad from 1st to 10th January, 1993.

The World Trade Fair is expected to be the largest event for industry and business to be held in India with the participation of 4,000 exhibitors and 4,000 delegates from India and abroad. It will cover the entire gamut of industry and business and would help to explore the various opportunities for foreign collaborations as also the innumerable investment and export opportunities.

The fair, which is being organised on a self-supporting basis, will comprise an International Exhibition spread over an area of 7,00,000 Sq. Mtrs. (180 Acres) and a conference with 9 separate international seminars on different Industries. The World Trade Fair is bound to bring about foreign investments in new industries on the one hand and open up export opportunities on the other. Exhibitors, delegates and speakers are expected from a large number of countries. The World NRI Conference is expected to attract around 2,000 NRIs from different parts of the World.

Ion Exchange planning greater focus on exports

Ion Exchange (India), which is implementing a Rs. 13.22 crore modernisation programme is expected to be fully operational in one and-a-half years. It has set its sight high on exports. Its aim is to achieve at least 12 per cent of its total turnover from exports. The present export is Rs. 10 crore this year, according to **Mr. V.G. Rajadhyaksha,** Chairman of the Company.

The company's plan is for doubling of the present turnover of Rs. 65 crores in the next five years and ensuring that the profit grows even faster. The export market which it began to explore three years clearly offers an even great challenge. Again exporting water treatment technology in any form viz., plant, process know-how and servicing/maintenance is a field which the company pioneered.

After the devaluation of the rupee, the opportunity to export services and equipment not only to its own installations but to help to maintain and optimise the operations of plant supplied by others, will be fully exploited. For this purpose, it has set up a joint venture with a U.S. firm — Fermentation Technology which will be marketing the company's services and technologies.

The object of the modernisation is to improve the overall productivity and profitability. Modernisation would be in the resin, membrane, effluent treatment, consumer products and industrial chemicals divisions, as well as in research and development (R&D) centre.

Marketing and infrastructural facilities would also be strengthened by intensive use of computers both for speeding up information flow and design through CAD, all of which would speed up execution and improve productivity. Mr. Rajadhyaksha explains that the company's plans rest on a set of strategies for exploiting both the growing domestic and the even faster growing export market. On the domestic front, the company has entered into collaborations/joint ventures with some of the leading companies in such fields as reverse osmosis, ultra-filtration, water quality testing instruments, speciality resins and water treatment chemicals so that its reputation as a pioneer of water and effluent processing technologies would be further strengthened.

Added to all this is the company's unique capacity to undertake its own R & D to develop new products and processes. It presently spends over three per cent of its turnover on R & D. With the increasing scarcity of good water and the much greater attention to pollution control, the demand for the company's products and services would not be hit by the recession, he added.

The after-tax profit is expected to be in the region of Rs. three crores during the year ended March 1992, giving an earning of Rs. 8.5 per share against Rs. six per share last year.

ALFA OLEFINS IN SHAMPOO NOT CARCENOGENIC: GOVT

The Government has allayed fears of the Rajya Sabha members that the alfa olefins used in the manufacture of shampoos and detergents was carcinogenic.

Replying to supplementaries during the question hour, the Minister of State for Environment, **Mr. Kamal Nath,** admitted that sultone an intermediary produced in the manufacture of alfa olefins was cancer causing. But in the new process adopted in the manufacture of alfa olefins, the sultone is converted into sulfonate, which was not cancer causing, he said.

Traders resent increase in sales tax

The Maharashtra government has hiked the sales tax on dyes and chemicals from 4 per cent to 10 per cent for all items except those to be notified and included from time to time under Section 37. This new rate came into effect from May 1, 1992.

"This steep increase in sales tax is quite inopportune, retrograde and blow to the dyes and chemicals industry and trade in state" said **Mr. R. Natrajan,** President of the Chemical & Alkali Merchants Association. In a letter to the State Finance Minister, the association has stated that in the past two years, the prices of almost all products, whether locally produced or imported, have increased by minimum 25 per cent, due to general inflation in the country, increased labour cost, investment in pollution control facilities, transport costs etc. These increases have adversely affected the demand. Any increase in price resulting from higher tax will further weaken the demand, the association said.

The association has added that the whole world is watching the Indian Government's action plan to get a devastated economy back on the rails, "All of us have been unanimous in applauding the efforts of the Prime Minister, the Union Finance Minister and the Commerce Minister, for their commitment to introduce a long term reform package with a definite emphasis on tariff and tax reduction.

The liberalisation and tariff restructing in the last few months have had its salutary effect on the economy". According to trade circles, in the light of this situation the government's efforts and priority ought to be to control inflation and decrease expenses rather than resorting to traditional revenue sourcing methods which ultimately will be borne by the man of the street.

They reveal that they are disturbed and surprised by the actions of a progressive state like Maharashtra to move in a direction counter to that of the central philosophy. "Such moves not only affect the trade, industry and the common man but also the global perception of our nation, for which purpose the central and state policies cannot be viewed in isolation"

They also warned the state government that this move will only force the dyes and chemicals industry and trade to migrate to neighbouring states reluctantly not to speak of the evil of evasion, malpractices and the attendant corruption. The trade and industry have requested the state government to roll back the sales tax rate to the original level of 4 per cent in the interest of the industry and trade in Maharashtra and the nation in general.

Hike on plastic piping systems too

The Maharashtra Government has also amended the Sales Tax Act effectively increasing the sales tax burden inclusive of turnover tax on farm piping systems from 3.25% to 10.21%.

The plastic processing industry has deplored this as an anti-industry and anti-farmer act. **Mr. P.F. Bafna,** vice-president of Organisation of Plastics Processors of India (OPP) said the steep hike could not have come at a worse time than now when large parts of Maharashtra are facing severe drought and, many units manufacturing piping systems for agricultural use, have already closed down for want of adequate demand.

To add to the woes of the industry, the price of plastic raw materials have firmed up in the international market. For example, PVC prices has increased from $495 to $560 per tonne thereby increasing the manufacturing costs. With the increase in sales tax rate the total impact would be to increase the cost of piping systems by 13-14% which the farmers can ill afford, Mr. Bafna said.

CSIR lab to pioneer edible palm oil manufacture

Indigenous edible grade palm oil is likely to hit the market soon and reduce India's giant edible oil import bill, following successful development of palm oil extraction technology. After four years of field trials, scientists at the Regional Research Laboratory (RRL) Thiruvananthapuram, are now helping to set up the India's first commercial plant for edible palm oil at Pedavegi in Andhra Pradesh.

The RRL technology has already proved successful at a demonstration plant, capable of processing 1,000 kg of palm fruit per hour, located at Palode, 40 km North of Thiruvananthapuram. "The palm oil process technology is ready for transfer", says **Dr. A.D. Damodaran,** Director of RRL. "We hope at least ten more commercial units for edible palm oil will come up by the turn of the century".

India is the world's largest importer of edible oil. Imports of this commodity amounted to 525,000 tonnes, worth Rs. 325 crores, during 1990-91. Palm oil is a significant part of edible oil imports. The RRL technology is designed to process fruit from 200 hectares of oil palm crop under cultivation. The process technology covers fruit harvesting, stripping, oil extraction and purification.

"We've designed a commercially-viable small unit that is suited to the socio-economic conditions in India where there are many small plantations", Dr. Damodaran said. Agricultural scientists have identified 500,000 hectares of land in Andhra Pradesh, Karnataka, and Maharashtra as suitable for oil palm cultivation and set up demonstration plantations of 1,000 hectares each in the three states.

A single hectare of oil palm crop can give four to six tonnes of palm oil. "This makes it the most economical of all oil crops", says RRL scientist, **Mr. C. Arumughan.** The palm oil extraction technology developed at RRL requires low investment, production costs are low, and is totally based on indigenous design and equipment. Process efficiency is over 90 per cent.

The red-coloured palm oil extracted by the RRL technology has very high levels of carotenoids — compounds related to vitamin-A — that provide the oil a potential role in combating vitamin-A deficiency, Mr. Arumughan said. Palm oil extracted from a commercially-popular species of the crop called 'tenera' has 700 parts per million of carotenoids, making it the richest natural plant source of pro-vitamin-A.

The red palm oil contains levels of compound called retinol, 15 to 300 times higher than those found in common vegetable sources of this compound like green leafy vegetables and carrots. These findings have prompted RRL to initiate studies with the National Institute of Nutrition (NIN) in Hyderabad to determine whether palm oil could be used in vitamin-A supplementation programmes.

Studies conducted by NIN on edible grade palm oil supplied by the RRL have shown that the oil is nutritionally-adequate and safe for human consumption. The red palm oil was found to be well-acceptable to 90 per cent of a group of children when it was incorporated into their mid-day meals, RRL scientists said.

Success in micro-encapsulation technologies

The flavour of cardamom, ginger or any other spices can now be added instantly to tea, coffee and soft drinks at negligible cost. This has been made possible by a new techniques called micro encapsulation developed by the laboratory. In the technique, heat sensitive volatile flavours are entrapped in a continuous polymeric film of edible nature. The stability of the flavours is tremendously increased and the flavour is available instant release at the time of use.

Dr. Damodaran said the new product, in the form of free flowing powder, could be ideally used for the preparation of dry mixes for soft drinks, candies, chewing gums, confectionery and baked goods. Only 30 mg of the powder was sufficient for a tea bag to make very good cardamom flavoured tea. This would increase the cost of the tea bag by only three paise, Dr. Damodaran told visiting media persons at the RRL.

The RRL has successfully micro-encapsulated other flavours like ginger oil, cumin oil and pepper oil. The micro-encapsulation technique was ready for transfer for commercial purposes, Dr. Damodaran said demonstrating the various flavours. The RRL had made tremendous advances in the development of several other new products for which technologies would be transferred shortly. The scheduled transfer of technologies include coconut cream, spices oils and oleoresins, poly coir, zeolite and high grade synthetic rutile.

Dr. Damodaran said the spices board had agreed in principle to establish a technology business centre at the RRL with the support of the Government of Kerala and the Department of Scientific and Industrial Research. A proposal for setting up a sensory evaluation facility at RRL was under processing, he said. The spices board earlier had two projects related to quality evaluation of cardamom and value added products for spices.

Use of zeolites developed

Scientists at the RRL have successfully developed zeolite as a detergent builder. This is specially significant as many developed countries have banned

sodium tripolyphosphate (STPP), the commonly used ingredient in detergents. This has been banned as too much influx of phosphate in water bodies results in eutrophication.

The raw material for zeolite is china clay, which is abundantly available in Trivandrum and Quilon districts of Kerala. The Kerala State Industrial Development Corporation and Bharat Starch and Chemicals, New Delhi, have signed a memorandum of understanding for promoting a Rs. 50-crore project for the manufacture of zeolite from clay. Dr. Damodaran said zeolite was toxicologically and ecologically safe and large scale production was feasible as raw material was available in plenty.

The technology developed by the RRL for processing of coconut cream would considerably help the cultivators and consumers, said Dr. Arumughan. A pilot plant for the production of coconut cream was commissioned at the Kalamassery industrial estate near Cochin with the help of the coconut development board.

The natural flavour of this cream was better than of those produced in other countries, he said. The technology has been released to two private entrepreneurs for commercial production with a capacity of 10,000 nuts a day.

Ten plants for polycoir likely

Polycoir is a new thermoset mouldable natural fibre polymer composite, developed by the RRL in cooperation with the Coir Board. As a substitute for wood-based products, polycoir has enormous potential from door panels to acoustic applications.

Ten commercial plants for the production of polycoir is planned in association with Coirfed.

Recalling the performance of the RRL, Dr. Damodaran said it had 32 patents in 1992. The work plan involved societal control related programmes, research with international standards and development of technology to be economical in Indian context.

He said a new divison was being set up for the transfer of technology. This programme involved vigorous technology marketing efforts jointly with appropriate consultants and financial agencies and systematic entrepreneurship training programmes making use of the demonstration facilities.

The Department of Ocean Development would establish a unit at RRL for pollution transport studies related to the coastal region and this would have high futuristic significance particularly for Kerala, he said.

BALAJI AMINES

Innovative technologies in picoline project

Balaji Amines Limited, have implemented a project for the manufacture of Amines (methyl & ethyl) at Tammalwadi village, Osmanabad District which is a most backward area in Maharashtra state. (Vide CW 5th May page 62). The plant was successfully commissioned for methylamines within one year from the date of starting the construction. The innovative designs in the plant, low project cost and using sugar cane bagasse as fuel for the boiler have permitted the company to show very good results in the first year of operation itself. The sales of methylamines crossed Rs. 500 lakhs in the year ending 31.3.92 and the company earned a gross profit of the Rs. 80 lakhs against paid up equity share capital of Rs. 130 lakhs with EPS of 2.36. The above results are achieved in first year of operation itself overcoming all the initial teething troubles which are expected in commissioning a high technololgy product like methylamines. This being a first year of operation, the company has utilised the plant capacity to the extent of 50 to 55 per cent only.

The company is planning to start manufacturing ethylamines also in the same plant by purchasing the balancing equipment and creating storages. The company is expecting to utilise the capacity of the plant up to 90 per cent due to manufacture of ethylamines also in the same plant due to which the company expects to double the profits in this year.

The company is planning to set up pyridine picolines plant having a capacity of 1,000 tpy. The company entered into an agreement with **Dr. P.S. Murti,** of Kobe Engineering Consultants (P) Ltd. (KECL) for transfer of technology, for manufacture of pyridine/picolines. M/s. KECL has given the technology for manufacture of methylamines and ethylamines also. The project report for Rs. 1,650 lakhs is under appraisal by IFCI.

Breakthrough in design of reactor

M/s. KECL has designed and operated a pilot plant with fluidized bed reactor having a capacity of 50 TPA. After successful demonstration of pilot plant. M/s. KECL has continued their R&D work on pyridine/picolines in their laboratory resulting in a breakthrough in the design of fixed bed reactor which will avoid catalyst loss due to attrition and carryover. All the present manufacturers are using the conventional fluidised bed reactor. The KECL has also succeeded in improving the catalyst by doping base with metals on the commercially available silica alumina pellets. The pilot plant has run with the modified catalyst over a period of 3 months on continuous basis.

The recoverable yields are consistantly higher than those with conventional catalyst without modifications. The consumption of raw materials are significantly lower due to which the cost of production can be considerably reduced.

Pyridine by dealkylation

The capacity of the plant is 1,000 TPY which includes pyridine, beta picoline and Gamma picoline. One more innovative design in the plant is setting up of dealkylation unit in the plant. This unit will convert the alpha picoline into pyridine as at present there is not much demand for alpha picoline in India. There is no party in India manufacturing vinyl pyridine which is mainly used by tyre cord industry. If any unit is set up for vinyl pyridine the alpha picoline can be sold to them. This dealkylation unit is not existing either with the existing plants or one in offering.

Demand for pyridine/picolines is currently put at about 2000 MT per year and the installed capacity at present is 500 MT with the sole producer M/s. Vam Organics Ltd. Another unit of M/s. Armour Polymers Ltd. is likely to start production in the 3rd quarter of 19 with a capacity of another 600 MT year. Demand however is expected go up to 2,600 MT in the next few y with a growth rate of 10 to 12% year.

The current demand gap is met imports from Japan, Belgium and US With the entry of Balaji Amines, imports will be totally substituted indigenous sources. The four produc pyridine, alpha, beta and gamma pic lines are well known for their esta lished uses as solvents, catalysts, int mediates in the manufacture medicines and dietary supplements. T demand for these compounds in pha maceutical, agricultural (insecticide pesticides etc). and polymer fields increasing at a faster rate.

Uses

The uses of the various products are follows:

PYRIDINE

Pyridine is used in agrochemica pharmaceuticals, dyes, solvent, denat rant for alochol, polymers and as labor tory reagent.

Agrochemicals

In agrochemicals it is used in t manufacture of:

(a) Insecticides : Chlorpyrifos, pyret roid.
(b) Herbicides : Trichlopyr, diqua paraquat and pyridoxy phenyl
(c) Fungicide : Buthiobate
(d) Nematocide : Dienena
(e) Growth regulators : Piproctan Bromide.

Pharmaceuticals

In Pharmaceuticals it is used in th manufacture of:

(a) Antihistamines : Triprolidin doxylamine carbinoxamine, pheni amine, chloropheniramine and bro mopheniramine
(b) Antihypersensitive : Pinacidil
(c) Chodine stearase inhibitor : Distig mine bromide and pyridostigmin bromide

(d) Diagnostics : Diodene and propylidone
(e) Bronchodilator : Rimiterol
(f) Anti biotic : Cephapirin and in bromazepan (tranquiliger), pitonime (anti-inflammatory), diperiden (anti-parkinson).

Solvent

As a solvent it is used

(a) in the manufacture of SMX. Chloramphenicol and metronidazole,
(b) in rubber, dyes (vat dyes) and in polymers (polycarbonate)

Laboratory reagent

As a laboratory reagent it is used as karl fisher reagent, UV spectrometer solution and in the analysis of hydroxy group in polymers.

Catalyst

As a catalyst it is used in acylation, as a sulphating agent, in the manufacture of anti biotics and in phase transfer catalyst as DMPA and MPP.

Alpha picoline

Alpha picoline is the main raw material for the production of vinyl pyridine. It is also used in the manufacture of:

(a) pesticides like pichloran, lorantal and tordan
(b) drugs — doxilamine, beta hestine, methyridine amprulium and other drug intermediates like picolinic acid and metal picolinates.

Beta picoline

It is used in the manufacture of 3-cyanopyridine, niacin and niacinamide.

GAMMA PICOLINE

Gamma picoline at present is mainly used in the manufacture of INH and 4-cyanopyridine.

OTHER DERIVATIVES OF PYRIDINE/PICOLINES

A number of other derivatives of pyridine/picolines used as intermediates are as follows:

(a) Amino. chloro and nitro pyridines.
(b) Hydroxy pyridines.
(c) Pyridine-N Oxides & picoline-N-oxides.
(d) Pyridine hydrobromide.
(e) Pyridine carboxylic acids.
(f) Methyl ethyl pyridines.
(g) Aryl and poly vinyl pyridines.

The plant is coming up at the same site of present amines plant which has got the following advantages.

(a) The present project has got ammonia storage duly approved by chief controller of explosives. Hence if located at the same site, there will be substantial saving in the ammonia storage cost.
(b) No extra expenditure for power sub-station is necessary as sufficient capacity is already exists. This is a saving of more than Rs. 50 lakhs at today's prices.
(c) The water is being used from bore well which has got sufficient additional capacities to take care of expansion.
(d) All the existing facilities like office buildings, stores, telephones, telex and weigh bridge etc. can be used for the new project.
(e) The site is situated in sugar cane growing area having number of sugar factories. The bagasse is very cheaply available from the sugar factories for using as a fuel for the boiler. Presently only bagasse is used in the boiler due to which the cost of the steam generation is Rs. 125/- per M.T. instead of Rs. 450/- to others.
(f) The other raw materials required like acetaldehyde is available from more than 2 sugar factories within 200 kms from the site. The formaldehyde is also available within 250 kms of the site.

Due to the above reasons, the per tonne investment is lower when compared to others and the company hopes to implement the project within one year from the data of approval from IFCI. The company will be approaching the public shortly to finance the part of the project cost.

A rapid wrap-up of what's new in Operations, Processes and Products

New Catalytic technology commercialised in the U.S.A. during the 1980's

J.N. Armor (of Air Products, U.S.A.) has given an exhaustive review of the new catalytic technology adopted in chemical, petroleum and environmental sectors. In the chemical sector some prominent examples are: 1,4-butanediol from hydroformylation of allyl alcohol; chiral epoxides of allylic alcohols; hydrogenation of MDA to bis-(4-amino cyclohexyl) methane; paracetamol from *p*-acetyl phenol (PAP) and ibuprofen from the hydrogenated product of PAP; Avermectin to ivermectin with Wilkinson catalyst; LAB with solid 'acid' catalyst; butane to maleic anhydride; dimerisation of butenes with supported Ziegler Catalyst; MTBE/ETBE with acidic ion exchange resin (IER); catalytic dehydrogenation of isobutane/propane; hydration of isobutene with IER.

In the polymer area we have the outstanding example of LLDPE and flexomers as well as polypropylene; group transfer polymerisation has also made some impact.

Improved cat-cracking catalysts (eg. Y type zeolites) have been commercialised. The conversion of LPG to BTX via a two-step process has been commercialised on a pilot scale. Xylene isomerisation catalysts have also made dent. (*Applied Catalysis*, 1991, **78**, 141-173).

Chiral Lewis acid catalysts

Corey and Loh have developed a catalyst based on (S)-tryptophan which allows the reaction of 2-bromoacrolein with an excess of cyclopentadiene to produce the (R)-adduct in a ratio of 200:1 (R/S) and 96:4 simple diastereoselectivity. (*J. Amer. Chem. Soc.*, 1991, **113**, 8966).

Schmidt and Seebach have improved on the enantioselective Lewis-acid catalysed addition of dialkyl zinc reagents to aldehydes. (*Angew. Chem. Int. Ed. Engl.*, 1991, **30**, 1321).

Catalytica's Wacker process for acetaldehyde (chlorine free)

The standard redox system of $PdCl_2$-$CuCl_2$-CuCl has been replaced by a proprietary phosphomolybdovanadate polyoxyanions/$PdCl_2$ system. This ensures that chlorinated by-products are not formed. Butenes to MEK can also be conducted with this catalytic system. (*Euro. Chem. News*, 1992, 27 Jan., p. 34).

Solvent Extraction: Electrically driven

NATCO (Tulsa, USA) has developed a new solvent extraction device which has no column internals. The test system was recovery of acetic acid from dilute aq. solution. This is injected from the top of the column by a nozzle surrounded by a charged grid of electrodes. This allows water to be dispersed as fine drops. Electrically charged plates apply an electrical field along the length of the column, causing the water droplets to coalesce and disperse repeatedly. A 2 ft. tall pilot column has been installed by Hoechst-Celanese. (*ibid*, p. 17).

Separation of *m*- and *p*-xylene via selective alkylation dealkylation

Ghosh and Sharma have carried out alkylation of a mixture of *m* and *p*-xylene with isobutylene, at -10 to 20°C, with conc. sulphuric acid as a catalyst. Filtrol-24 (acid activated clay) acts as a good catalyst at 80 to 130°C for alkylation and even diisobutylene can be used as a source of isobutylene. Selective alkylation of *m*-xylene occurs in both the cases but in the latter case 5-*tert* butyl *m*-xylene isomer is formed selectively. Dealkylation can be done at higher temperature and even transalkylation with phenol can be done. (*Ind. Eng. Chem. Res.*, 1992, **31**, 445).

A new zeolite for cat-cracking in petroleum refineries

Estermann **et al** have reported a new cubic gallophosphate, as opposed to the more common aluminosilicate which has a pore opening of 20Å, arranged tetrahedrally in the shape of a four-leafed clover (and hence called Cloverite). This sieve can accommodate larger molecules than previous sieves. A supercage of dia of 29 to 30Å is formed. (*Nature*, 1991, **352**, 320).

Wet-air oxidation for waste water with high COD

Wet air oxidation is typically carried out at 250°C with pressure like 50 atm and can reduce COD by upto 95%. The Kenox process has a patented reactor design which consists of a tube nearly 10 m high and about 0.5m in dia and has a central core containing a specially designed static mixer. Energy integration is provided by way of treated wastewater for preheating the feed, waste heat utilisation from the off-gases, etc. (*The Chem. Engr., Instn. Chem. Engrs.*, UK, 1991, 28 Nov., No. 508, p. 16).

New Currents in Mixing

High efficiency fluid mixing impellers with blades of aerofil shape have now become popular. How these impellers can be adopted for suspension of solids has attracted attention in the recent past, as for a specified duty a considerable reduction in power consumption can be realised. Here "dead spots" have to be avoided. For real power savings a modified tank bottom such as the cone-end and the fillet designs is highly desirable.

Mixing is also important in consecutive reactions and addition times of 40-200 seconds may cause bromination reaction to allow tribromide to appear ahead of both mono- and di-bromo products. A network of zones model has been used to characterise mixing. (*ibid*, p. 17).

Monohalogenated nitromethane

Angus Chem. Co. (USA) has claimed that nitromethane can be brominated with bromine to give Br CH_2NO_2 in the presence of NaOH; $NaHSO_3$ is used in the last step. (U.S.P. 5,043,489 of August, 1991; *Chem. Abstr.*, 1992, **118**, 20682).

Catalytic oxidation of benzoic acid (BA) in acetic acid

Itoh et al have shown that BA, in acetic acid, can be oxidized with Pd catalyst to give isomers of hydroxybenzoic acid, 2,5-dihydroxybenzoic acid, etc. Apparently H_2O_2 is formed *in situ*. (*J. Mol. Catal.*, 1991, **69**, 215).

Oxidation of aqueous glyoxal to glyoxalic acid

Gallezot et al have shown that Pt/C catalyst is effective in oxidising aq. solutions of glyoxal with air at slightly above room temperature; pH should be regulated to be near neutrality. A yield of 70% at 85.5% glyoxal conversion has been realised. (*J. Catalysis*, 1992, **133**, 479).

Salicylaldehyde from salicylalcohol

A Chinese claim indicates that salicyl alcohol can be oxidised, in the presence of Schiff bases or β-diketone non-noble metal complex and a strong base like NaOH/KOH, in the temperature range of 0 to 110°C. Thus a ethylene diamine-salicylaldehyde complex was used along with cobalt acetate. 82% salicylaldehyde was realised. (*Chem. Abstr.*, 1992, **116**, 20775).

Isoprenyl alkyl ethers

Snam-Progetti has claimed that a mixture of Pd $(PBu_3)_4$, PBu_3, MeOH and C_5-hydrocarbon feedstock from steam cracking of naphtha (which contains about 32% isoprene) can be reacted at 110°C to give isoprenyl methyl ethers in 86% selectivity, pentenyl Me ether (98% selectivity) and cyclopentenyl Me ethers (57% selectivity). Under these conditions isoamylene did not react. (*E.P. 450,707, Oct. 91; cf Chem. Abstr.*, 1992, **116**, 20685).

Oleochemicals: Use of "synthetic" vs "natural" feedstocks

C.A. Schirber (of Vista Chem. Co., U.S.A.) has given a very systematic account of pros and cons of synthetic vs natural feedstocks. The availability of Palm-Kernel from Malaysia and Indonesia, apart from coconut from Philippines, has made a lot of difference and provides an edge to "nature" (renewal) raw materials. However, if we take a view for next 10 to 15 years it becomes evident that LAB and synthetic fatty alcohols will play an important role. (*Inform*, 1991, **2**, No. 12, 1062-1972).

Cyclohexanol from benzene via cyclohexene

Fukuoka and Nagaham (of Asahi Chemical Industries, Japan) have reported partial hydrogenation of benzene to cyclohexene at 120-180°C and 30 to 100 atm. in the presence of Zn-promoted Ru. Hydration of cyclohexene to cyclohexanol was carried out with high-silica zeolite as a catalyst. (*Chem. Abstr.*, 1992, **116**, 62001).

Sulphated zirconia superacid catalysts: Dehydration of 2-Octanol to octene-1

Srinivasan and Davis have shown that properly produced sulphated zirconia shows a remarkable activity for dehydration of 2-octanol to predominantly octene-1. Normal zirconia shows rapid decline in selectivity. (Symposium in Alkylation, Aromatization, Oligomerization and Isomerization of short chain hydrocarbons over heterogeneous catalysts, Div. of Pet. Chem., A.C.S., Aug. 1991, p. 635).

Separation Processes

Separation of close boiling phenols and naphthols

Ghosh and Sharma have developed an ingenious method based on selective O-etherification with isobutylene or isoamylene in the presence of acidic ion exchange resins as catalyst. The reaction was conducted between 5 to 30°C. Thus, phenol reacts selectively in the presence of *o*-chlorophenol; alpha-naphthol is sluggish and beta naphthol reacts in a facile manner. In the case of *alpha* and *beta* naphthols it is also possible to remove *alpha* isomer selectively via C alkylation at higher temperature. The ethers or C alkylated products can be cracked at higher temperatures to recover the desired phenol/

naphthol and isobutylene can be recycled. (*Reactive Polymers*, 1991/1992, **16**, 159).

Recovery of aromatic sulphonic acids (ASA) and quaternary ammonium compounds (QAC) from aqueous stream by adsorption

Pahari and Sharma have shown that activated carbons and polymeric adsorbents (e.g. XAD-4) can be successfully used to remove the highly undesirable solutes in waste streams and which can not be treated biologically. Regeneration of activated carbons loaded with ASA is not satisfactory either with organic solvents or even alkali. However, polymeric adsorbents loaded with ASA can be regenerated with solvents like methanol, acetone, etc. Adsorbents loaded with QAC can be regenerated with, say, methanol. (*Separation Technology*, 1992, **2**, 39).

Selection of solvents in liquid-liquid extraction

Mehiai and Newsham have computed liquid phase solute-solvent interaction energies, using a molecular graphics system coupled with mainframe Monte Carlo simulations, to arrive at a rational procedure to select solvents. Examples taken up are: toluene-heptane; phenol-water. The effect of temperature has also been covered. A good agreement with experimental data is reported. (*Chem. Eng. Res. Des.*, 1992, **70**, Part A, 78).

Catalysis

Asymmetric Hydroformalytion

Castonguay **et al.** have stressed the importance of steric factors in determining the regioselectivity of a class of Pt (II) catalysts. (*J. Amer. Chem. Soc.*, 1991, **113**, 7177).

Co-polymerisation of CO with olefins to produce perfectly alternating polyketones

Drent **et al.** have shown that homogeneous Pd catalyst allows the title reaction to occur to produce functional polymers. (*J. Organomet. Chem.*, 1991, **417**, 235).

Carbonylation of cyclohexane with CO

Nakara **et al** have succeeded in using Pd acetate catalyst to carry out this difficult reaction to give cyclohexane carboxylic acid. (*Chem. Lett. (Japan)*, 1991, No. 8, 1437).

N-Alkylaminophenols

Sumitomo has claimed that reductive alkylation of an aminophenol, with an aldehyde or ketone, can be carried out in an organic solvent in the presence of H_2 and Pt or Pd based catalyst. (E.P. Appln., 427,572 A, of *Plat. Metals. Rev.*, 192, **36**, 63).

Cycloolefins

Asahi Chem. Ind. has claimed that a Ru catalyst allows selective hydrogenation of monocyclic aromatics to the corresponding cycloolefin (e.g. benzene to cyclohexene) (*Plat. Metals Rev.*, 1992, **36**, 66).

Reaction of chlorobenzene with methanol on ZSM-5

Palekar has shown that the zeolite ZSM-5 allows the reaction under reference to give anisole with selectivity of 30-40%. Significant quantities of methyl anisoles are also formed. (*J. Catalysis*, 1992, **134**, 373).

Metathesis reactions

Grunert has discussed the question of active sites of metathesis catalysis. The contribution of homogeneous catalysis in elucidation of the reaction mechanism has also been discussed. The catalysts are based on W, Mo or Re and metathesis is favoured when the polar substituent is far from the double bond. Some industrial examples, such as, neohexene from metathesis of diisobutene and ethylene, Shell's SHOP process for higher internal olefins, are cited. The reaction proceeds via a metallocyclobutane intermediate. (*Ind. J. Technol*,, 1992, **30**, No. 3, 113-136).

Isothiocyanate in broccoli may protect against cancer

A key chemical in broccoli has been identified that strongly induces enzymes that protect against cancer. Other vegetables like cauliflower, mustard, Brussels sprouts, etc. also contain this chemical identified as (-)-isothiocyano-(4R)-(methylsulfinyl) butane (also called sulforaphane). (*Chem. Eng. News*, 1992, 30th March, p. 16).

Amoco's new technology for ethylene/propylene polymerization

Amoco has claimed a new hyper-active catalyst which does not leave an undesirable residue. Polyethylene, polypropylene, and ethylene-propylene co-polymers, with high impact strength, can be produced. Apart from the new catalyst, a new reactor design which employs mechanical agitation (rather than a simple gas-fluidised bed) allows close to plug-flow behaviour. Heat is removed by the latent heat of vaporization of the olefin. Since the inventory of the hydrocarbon in the reactor is small, as there is no liquid, the new process is inherently safer than other processes such as slurry polymerization. (*Chem. Eng. News*, 1992, 30 March, p. 17).

Surface Chemistry

Prof. J.T. Yates has given a comprehensive state-of-art review on this subject which has an impact on heterogeneous catalysis, semi-conductor processing, new materials development, corrosion prevention, tribology and adhesion. Chemistry at surfaces is intimately connected with the structure of the adsorption sites on the surface that bind chemisorbed species. One method widely used for studying surface structures is LEED (Low Energy Electron Diffraction).

Recently, some interesting research has focussed on surfaces that are liquid. Thus Eisenthal and co-workers have applied optical second harmonic generation (SHG) methods to study the nature of dissolved ionic species at the air-water interface. The behaviour of dissolved alkyl phenolate anions, with varying length of alkyl groups, has been studied.

The old model reaction of decomposition of HCOOH to give either $CO_2 + H_2$ or $CO + H_2O$ continues to be of interest.

Direct calorimetric methods have been developed to measure the heat of adsorption on a single crystal.

Scanning Tunneling Microscopy (STM) has been used to study the recently developed buckminsterfullerene, C_{60}, film on a GaAs (110) surface.

New materials, such as zeolites, which brought in a new wave in catalysis, continue to attract attention. The recently developed K_3C_{60} has been found to be a super-conducting material. (*Chem. Eng. News*, 1991, 30 March, pp. 22-35).

Ion Exchangers (IE) as catalysts

W. Neier (of Deutsche-Texaco) has given a very useful account of this subject. The synthesis of synthetic resins-based ion exchangers was first reported in 1935. The IE catalysts (IERC) were studied during second war in IG Farben, Germany, and patent applications were filed in 1952. Initially resins were based on phenol-formaldehyde resins. Later resins based on co-polymerization of styrene-divinylbenzene and acrylates or methacrylates were developed and these are now work horses. Both gel resins with areas like 1 m^2/g and microporous resins with areas of 250 m^2/g have been developed. There are distinct advantages in using IECR compared to dissolved acid catalysts. IECR are typically 0.3mm to 1.1 mm in size and most resins cannot be used above temperature of 120°C; Nafions can go upto 200°C but are very expensive.

Examples reported in this review are: Hydration of olefins like isobutene, propene, butenes etc. (additional examples are of isoprene, myrcene, myracaldehyde); dehydration of alcohols (e.g. diethylene glycol to dioxane; phenol methyl carbinol to styrene, etc.); addition of olefins to alcohols — this has become an area of paramount importance due to MTBE, ETBE whose production is approaching now 10 mtpa globally; conversion of ethers like MTBE to polymer grade isobutene; addition of carboxylic acids to olefins, e.g. propylene + acetic acid to isopropylacetate; solvolysis of epoxides.

Hydrolyses and trans-esterifications are also of practical importance.

Alkylations, such as phenols with a range of olefins, are of considerable importance and practiced widely. Oligomerisation of isobutylene/isoamylene is also of practical importance. (W. Neier, "Ion Exchangers as Catalysts" in Ion Exchangers, K. Dorfner (Ed.), pp. 981-1027, Walter de Gruyter, Berlin, New York, 1991).

A new cyclohexanol process via cyclohexene from benzene

Fukuoka and Nagahara (of Asahi Chem. Ind. Co., Japan) have given brief details of this novel process which is in practice in a 60,000 tpa plant in Japan since August, 1990. This process is distinctly superior to the existing processes based on air oxidation of cyclohexane from view points of safety as well as overall yields. High silica zeolite is used for hydration of cyclohexene in the aqueous phase at about 100°C; the reaction is carried out by suspending the zeolite in water and dispersing it using cyclohexene as the oil phase (the product is partitioned in favour of the organic phase). The conversion of benzene to cyclohexene is carried out in a liquid phase where water is the continuous phase and oil is the dispersed phase with Ru as catalyst at 120°C to 180°C and 30 to 100 atm. pressure. At 50 to 60% conversion, 80% selectivity has been realised and rest goes to cyclohexane. (Symposium on Alkylation, Aromatization, Oligomerization and Isomerization of Short Chain Hydrocarbons on Heterogeneous Catalysts, Div. of Petrochemical Chem., A.C.S., New York City Meeting, August 1991, p. 821-824).

Sulphated zirconia superacid catalysts

Srinivasan and Davis have brought out the advantages of zirconium oxide as a catalyst which possesses four chemical properties; acidic, basic, oxidizing and reducing properties. Sulphated zirconia has superacid behaviour and authors have reported TG/TDA data. They have also used the model reaction of dehydration of 2-Octanol to octene-1 and have shown that even at 220°C sulphated zirconia gives almost 100% selectivity for octene-1. (*ibid*, p. 635-639).

DRAFT EIGHTH PLAN DOCUMENT:

Strict monitoring of petro goods demand urged

The Planning Commission has estimated the balance life of oil and gas reserves in the country at less than 25 years even at the present low consumption level and warned that an uncontrolled growth in demand for petroleum products would make the balance of payments position unmanageable.

The draft Eighth Plan document called for strict monitoring of the demand for petroleum products during the plan period and beyond and said this was imperative for managing the nation's fiscal health. Oil production, which was 34.10 million tonnes in 1989-90, dropped to 33.02 million tonnes in 1990-91 and 30.34 million tonnes in 1991-92.

This pattern of decline is expected to continue in the early years of the Eighth Five-Year Plan. The fall in oil production, the document noted, has come when the country's balance of payments position was under severe strain.

The document estimated the demand for petroleum products at 81 million tonnes by 1996-97 and 125 million tonnes by 2006-07. The higher oil imports, to meet this demand would reduce the availability of resources for investment in the post-eighth plan period, it noted.

The document suggested that besides expanding existing refining capacity, the ministry must adopt conservation measures, pay attention to demand management and develop substitutes. Natural gas which is emerging as an important substitute for petroleum products, could be used in fertilisers, petrochemicals, power generation and for extraction of LPG for use as domestic fuel.

Such a step would save consumption of naphtha in fertilisers and petrochemicals sectors, furnace oil in the power sector and kerosene in the domestic sectors. Utilisation of compressed natural gas could substitute diesel and petrol in the transport sector and help save foreign exchange substantially. On the oil production front, the government has planned to develop Western offshore oilfields which might raise crude production to 50 million tonnes by 1996-97. Of this Bombay High would contribute 60 to 65 per cent and the rest would be from the Krishna-Godavari basin, the Cambay basin and the upper Assam oilfields.

The document emphasised the need to tone up oil exploration and development of wells for accretion of additional reserves in view of the decling reserve production ratio. Production of natural gas however is increasing progressively and expected to touch 30 billion cubic meters in 1996-97. In the power sector, consumption of electricity is expected to be around 622 billion kilowatt hours (kwh) at the end of the next 15 years.

With system losses expected to be brought down by atleast 4 per cent during this period, the total generation requirement would be 798 billion kw. The document estimated that production of coal would have to reach 308 mt by 1996-97 in order to achieve the plan targets for coal-based thermal power stations. The power sector consumes more than 50 per cent of the total coal requirement. There is an increasing consumption of specific coal in the power sector due to a drop in calorific value. The document also pointed out that the quality of coal might not improve much as the share of underground mining is not likely to improve during the next decade.

Growth in CIL likely only through internal resources

The main thrust of Coal India Ltd. (CIL), during the Eighth Plan will be toward achieving "growth with self-reliance". According to sources, the budgetary support for plan investment was likely to witness a sharp drop from 88 per cent in the Seventh Plan to less than 10 per cent in the Eighth Plan.

Generation of internal resources to finance a large share of plan expenditure and to discharge a higher level of debt service obligations, meeting at the same time the growing demand of coal for the nation was being identified as CIL's primary goal, the sources said. Reduction of unit cost at constant prices by improvement of system capacity utilisation and overall productivity, coupled with suitable adjustment of coal prices to neutralise the inflationary impact on input costs were the basic measures required to enable the company to achieve its objective.

The sources said that the mission of Coal India was to produce the planned quantity of coal efficiently and economically with due regard to safety, conservation and quality. According to the memorandum of understanding (MOU) signed between CIL and the Coal Ministry for 1992-93, the major objective of the company was to produce adequate quantity of coal to meet the demand of coal and coal products with due regard to quality and consumer satisfaction. The sources said CIL was to undertake a detailed exploration of coal deposits and develop technical know-how and organisational capability in coal mining and undertake applied research and development work related to exploitation and utilisation of coal.

CIL would also undertake investment in coal mining and related activities to fulfill short-term and long-term requirements. It had to reduce production cost per tonne of coal in real terms by improving production, productivity and effective utilisation of inputs. It would improve the mines' safety standards and lay increasing emphasis on afforestation and protection of environment as well as pollution control.

CIL plans to produce 210.2 million tonnes of coal during the current financial year including 61.2 million tonnes from underground and 149 million tonnes from opencast mines. It has also envisaged that it would generate net internal resources worth Rs. 676 crore during 1992-93 for plan expenditures. The sources said that in order to enable CIL to achieve its objectives and the level of performance set in the MoU, the government had agreed to assit the company in strengthening infrastructure by ensuring uninterrupted supply of adequate power to different coalfields including 567 mva from Damodar Valley Corporation (DVC) sources. The government would also assist CIL in arranging a regular supply of railway wagons to different coalfields, extend help in land acquisition by taking up the matter with the respective State Governments so that the land acquired was handed over under a time-bound programme.

The government had also promised to assist the company in all cases where inter-ministerial coordination was required and help it obtain necessary funds including credit under external assistance and in recovery of dues from DVC. Meanwhile, five projects costing over Rs. 100 crore and above had been delayed for a period ranging from 12 months to 72 months.

The Rs. 192.96 crore Soneput Bazari project and Rs. 112.05 crore Block-II project, which were to be completed by March 1991 and March 1987, would now be completed in March 1997 and March 1993 respectively.

17.5 million tonne crude supply tied-up

India has signed contracts for the import of 17.5 million tonnes of crude oil so far for the current financial year against the target of importing 26.5 million tonnes of crude oil worth about US $3,200 million, according to official sources.

In addition 11 million tonnes of petroleum products, more than 70 per cent of which was kerosene and diesel, worth $2,200 million would be required to be imported during 1992-93, the sources said. The sources said the quantum of the import of crude oil and petroleum products might vary either upward or downward keeping in view the country's requirement. The total investment would also vary accordingly in view of the market prices. According to the contract signed with oil producing countries, Saudi Arabia will supply five million tonnes of crude oil, while Kuwait will contribute four million tonnes, the United Arab Emirates one million tonnes, Malaysia 1.5 million tonnes and Russia four million tonnes.

In addition, Iran has signed a contract for the supply of two million tonnes and was likely to give one million tonnes of crude additionally, the sources said. The sources said the country was making efforts for the import of additional crude oil from these countries. The balance requirement of crude would be met by spot purchase. Regarding crude supply from Russia, the sources said there had been apprehensions that Russia would not be able to maintain its commitment to supply four million tonnes of crude but the situation had changed and supply from that country had resumed.

About petroleum products, the sources said that against the import of nine million tonnes last year, there was a proposal to import 11 million tonnes of petroleum products, this year. The sources said the country had firmed up its petroleum products imports with Kuwait supplying 2.1 million tonnes, the UAE 0.6 million tonnes, Bahrain 0.6 million tonnes, China 0.15 million tonnes, Russia 1.1 million tonnes and Malaysia 0.8 million tonnes. The rest would be procured either from spot purchase or from additional supply from these countries.

Oil imports put at 25% of total imports

A whopping amount of Rs. 12,966.51 crore was spent on imports of crude oil and petroleum products in 1991-92, according to information given by the Ministry of Petroleum and Natural Gas. Official sources at Calcutta said this meant that share of the oil import bill of the total imports of Rs. 47,797.38 crore in 1991-92, stood at over 25 per cent. During the year exports of petroleum products had amounted to Rs. 1,022.27 crore.

Total exports and re-exports between April 1991 and March 1992 stood at Rs. 43,828.03 crore, which was substantially higher than the Rs. 32,553.34 crore worth of exports in 1990-91. However, as against the jump in exports, imports increased by a smaller amount, leading to the narrowing down of the foreign trade gap, the sources added.

ONGC CLEARS GUJARAT'S PROPOSAL FOR GAS-BASED POWER UNITS

The Oil and Natural Gas Commission (ONGC) has cleared the proposal of the State Government to develop scattered gas-field near Khambhat in South Gujarat for setting up small gas-based power units, according to the adviser to the Chief Minister, **Mr. K.H. Khan.**

Speaking to newsman at Gandhinagar on May 11 Mr. Khan said 50 to 60 MW power units could be set up for power generation to meet the peak-load demands. Details had been worked out and some of the small scattered gas-fields were being opened, up he said.

Italian drug company to buy 10 per cent stake in Elder

Angelini SpA, a leading Italian pharmaceutical company, is picking up a 10 per cent equity in Elder Injectibles, a 100 per cent export-oriented bulk drug company promoted by the Rs. 40-crore turnover Elder group reports *The Economic Times*.

Angelini has licensed the Indian firm to manufacture an ester of ibuprofen, an advanced version of the popular pain killer. Elder Injectibles will produce approximately 10 tonnes a month using the process developed by Angelini. The Rs. 20 crores project, with an equity base of Rs. one crore, will also manufacture antibiotics like norfloxacin and ciprofloxacin for export, according to **Mr. Jagdish Saxena,** Managing Director of Elder Pharmaceuticals. Elder Injectibles plant at Patalganga is scheduled to be commissioned in the next few months.

On May 10, **Mr. Ramrao Adik,** Maharashtra's Minister for Finance and Planning, inaugurated Elder Semit, a sick company acquired by Elder Pharmaceuticals and converted it into a 100 per cent EOU to manufacture ampicillin, cloxacillin and amoxycillin bulk antibiotics. Elder Semit has already committed production of the company for two years to overseas buyers, Mr. Saxena said. This unit will generate annual sales of around Rs. 13 crores. Part of the output will be consumed by Elder Syria, a turnkey project being implemented by Elder, scheduled to begin manufacture of formulations in September.

Despite its name, Elder has no financial stake in the Syrian company. Elder group is also seeking registration of its bulk and branded products in European and African markets. The group expects to double its sales turnover to Rs. 80 crores during the current financial year.

Sigmatau, another Italian firm, has given an exclusive licence to flagship Elder Pharmaceuticals to market elcarnitine in India. The drug, for which Sigmatau holds the patent, is said to have wide applications in cardiac myopathy, ischaemic heart disease and kidney dialysis, among others. It is being introduced in India for the first time. Elder Healthcare, another group company, is being moulded into a company catering exclusively to the requirements of doctors specialising in ENT (ear, nose and throat) ailments. It will have a dedicated plant and marketing team promoting a total range of products in this area. Elder Injectibles and Elder Healthcare are going public later this year.

ELEGANT PHARMA

Elegant Pharmaceuticals Limited, a public limited company, has drawn up an ambitious programme for manufacturing of broad spectrum antibiotic bulk drugs viz ampicillin trihydrate and amoxycillin trihydrate in the first phase and ampicillin sodium sterile in the second phase of expansion. The company is being promoted by **Mr. Dhirendra Sanghavi** of Sanghavi Pharmaceuticals, a SSI unit, engaged in manufacture of capsules and liquid formulations. Their cough syrup 'Sanox' is well accepted amongst the doctors. The company will be entering the capital market in September 1992 with a public issue of Rs. 216 lakhs to meet the funds requirement for the project cost of Rs. 360 lakhs. The balance amount of Rs. 144 lakhs would be brought in by the promoters (including friends, relatives and business associates). The company is setting up a manufacturing unit at MIDC (Trans Thane Creek, New Bombay), an ideally located industrial area, 40 km from Bombay, as per World Health Organisation norms. Commercial production is expected to commence by April 1993.

Cepham promotes Punjab Antibiotics

The Cepham Group has promoted a Rs. 28-crore drug intermediate project, the Punjab Antibiotics Ltd., at Derabassi in Patiala district of Punjab. This is a joint venture with the Punjab State Industrial Development Corporation Ltd. (PSIDC).

The company is currently negotiating with a West European firm for technical collaboration for the proposed 180 tpa L-amino diol plant. The product is a drug intermediate required in the manufacture of life saving drugs like chloromphenicol, chloromphenicol sodium succinate and chloromphenicol palmitate which are used in the treatment of diseases like typhoid, influenza, pneumonia, leprosy and meningitis. In the new venture, the promoter group and associates will hold 25% shares, PSIDC 26% and the public 49%. The estimated outlay of Rs. 28 crores is to be raised through an equity capital of Rs. 16.50 crores, term loans of Rs. 11.35 crores and a state subsidy of Rs. 15 lakhs.

The country is currently importing L-amino diol and its derivatives at a foreign exchange outgo of around Rs. 200 crores per annum. When in production of L-base, the company plans to export about 40 per cent of its production to the neighbouring West Asian and African countries. As a result the company will be a net foreign exchange earner directly. Further, plans have also been confirmed to manufacture L-Base derivatives like Chloromphenicol sodium succinate and Chloromphenicol palmitate.

DEXO LABS TO BE MERGED WITH SOL

Dexo Laboratories Limited, an ailing company based in Andhra Pradesh, which manufactures bulk drugs is to merge with Standard Organics Limited (SOL). As per a scheme sanctioned by the Board for Industrial and Financial Reconstruction (BIFR), the company will be completely rehabilitated within 9 years and its net worth would become positive immediately on its merger with SOL. The dues of the banks and financial institutions would be cleared by the end of March 2000.

The Rs. 2.50 crore rehabilitation scheme will be financed through a contribution from SOL, internal accruals and tax benefits. As per the scheme of rehabilitation, SOL shall issue at par and allot to Dexo shareholders, shares of SOL in the proportion of one equity share of the face and paid-up value of Rs. 10 each of SOL for 20 equity shares of SOL having a face value of Rs. 10. The scheme also says that if any shareholder of Dexo does not want to opt to exchange shares as per the share exchange ratio approved under this scheme, those shares shall be redeemed by cash payment. SOL has been asked to plough back the amount of tax benefits of Rs. 123 lakhs resulting from the merger for the purpose of rehabilitation of Dexo and also provide interest-free funds of Rs. 112 lakhs towards the cost of rehabilitation scheme of Dexo.

SOL will also have to utilise Rs. 13 lakhs of internal accruals of Dexo division towards meeting a part of the capital expenditure required for revamping Dexo's plant. Dexo, promoted in 1980, was initially profitable but deteriorated in the mid-eighties due to its main products becoming obsolete, non-availability of critical raw materials and shortage of working capital funds. The net worth of Dexo was completely eroded as on March 31, 1989 and it was declared a sick company by BIFR in September 1990.

VITAL PHARMA TO MAKE CAPSULES

Vital Pharma Impex Ltd., is setting up a project to manufacture pharmaceutical-grade capsules with a capacity of 76 crores annually. The capsules will be manufactured by fully automatic process of proven technology in a centrally airconditioned, dust and pollution free environment as per World Health Organisation (WHO) and GMP specifications. The plant for the same will be set up at MIDC, Tarapur and the land has been acquired. The factory building is under construction and thus there will be less gestation period. By setting up the project at Tarapur, a notified backward area, the company will be entitled to income tax, sales tax and octroi benefits as well as subsidy.

The project cost is estimated at Rs. 417.50 lakhs, 83 per cent of the project cost will be financed by equity capital amounting to Rs. 347.50 lakhs of which promoters will be contributing Rs. 104.50 lakhs. The balance project cost will be financed by subsidy of Rs. 20 lakhs and DPG of Rs. 50 lakhs resulting in a very low debt equity ratio.

The company plans to export atleast 70 per cent of its production, which will earn foreign exchange for the country and tax-free profits for the company. The company has already finalised export orders from Malaysia, Vietnam, Nigeria, Africa, Bangladesh, Zurich, etc. The company is, therefore, confident of declaring a good dividend in the very first year of operations.

CORRIGENDUM

M/s. Hi-Tech Drugs Ltd., have clarified that, contrary to the report appearing in *Chemical Weekly* (May 5, 1992), M/s. Cibatul Ltd., is not a subsidiary of Ciba-Geigy, Germany.

M/s. Punjab Alkalies & Chemicals Ltd., Chandigarh, have noted that, contrary to a report appearing in *Chemical Weekly* (April 21, 1992), they are not engaged in the manufacture of ammonium chloride and are hence unaffected by the withdrawal of subsidy on the product. The company has also pointed out that it has made a profit of Rs. 10.28 crore for the year ended March 31, 1992.

(The errors are regretted — Editor)

Import of 106 drugs at official rate allowed

The government has allowed the import of 106 life-saving drugs and 37 life-saving equipment at the official exchange rate. The Ministry of Commerce has announced various life-saving drugs which are vital for curing some major diseases. Ever since the LERMS scheme was announced there were doubts whether the import of life-saving medicines and equipment will be allowed at the official rate.

In fact, the Commerce Ministry in its public notice last month had made it clear that the import of life-saving drugs and equipment will be allowed at the market determined exchange rate. This framework was not in line with the assurance provided by the Finance Minister in his budget speech that foreign exchange rate would be made available at the official exchange rate for the import of life-saving drugs.

Hence, the revised policy for the import of life saving drugs at the official exchange rate. The following is the list of life saving drugs and life saving equipment permitted by the Commerce Ministry for import at the official exchange rate:

Part-I — Life-saving drugs

5-Fluoro cytosine tablets/capsules/injections. (2) 6-Isoguanine tablets. (3) Aclarubicin injection. (4) Actinomycin-D injection. (5) Aminogultethimide tablets. (6) Aminodarone Hydrochloride capsule/injection. (7) Amiphenazole injection. (8) Amrinone lactate injection and tablets. (9) Anti-Diphtheria Normal human immunoglobulin injection. (10) Anti-pertussis normal human immunoglobulin. (11) Anti-plague serum. (12) Anti-Pseudomonas normal human immunoglobulin. (13) Anti-rabies normal human immunolobulin injection. (14) Azathioprine injection & Tablets. (15) Biological Diagnostic agent namely Agglutinating sera. (16) Bleomycin injection. (17) Blood Group Sera. (18) Bovine thrombi... Vitro tests for Diagnosis in Haemorphagic Disorders. (19) Bretylium Tosylate Injection. (20) Bromodeoxyuridine injection. (21) Calcium disodium Edetate injection. (22) Carboplatin injection. (23) Carmustine (BCNU) injection. (24) Cefoperazone Sodium injection. (25) Cesium Tubes. (26) Cheno Deoxycholic Acid. (27) Cholestrymine in Sachets. (28) Chorionic Gonadotrophin injection. (29) Chrisumas factor concentrate (Factor IX). (30) Clindamycin Capsule/injection. (31) Corticotrophin injection. (32) Cyclosporine capsule/tablets. (33) Dicarbazine (DTIC) injection.

(34) Diagnosic agent for detection of Hepatitis B antigen. (35) Daunorubicin Hydrochloride injection. (36) Desferioxamine Mesylate. (37) Diagnostic Kits: — (1) Elisa Diagnostic test kit. (2) Radio-immundassay kit for Hormones (T3, T4, TSH insulin, Glucogan, Growth Hormones, Cortizol, L.H. and FSH and Digoxin) (3) Immunoassay kit for Blood Fibrinogen degredation product for direct estimation for diagnostic test in D.I.C. (38) Diazoide injection. (39) Dimercaprol (BAL) injection.

(40) Diphtheria Anti-Toin Serum. (41) Disopyramide Phosphate injection/Capsules/Tablets. (42) Dobutamine injection,. (43) Doxorubicin Hydrochloride injection. (44) Dried fibrinogen. (45) Edrophonium Chloride injection. (46) Epirubicin injection (47) Estramustine Phosphate capsules. (48) Fat Emulsions for intravendus nutrition. (49) Ftorafar injection & Capsules. (50) Floxuridine (5-FUDR) injection. (51) Solution containing Human follicle stimulating and luteinsing Hormones. (52) Gas Gangrene Anti-Toin Serum. (53) Glucagon injection. (54) Hepatitis B Vaccine. (55) Hepatitis B immunoglobulin. (56) Hexamethylmolamine injection. (57) Histoglobulin injection. (58) Human Normal immunoglobulin injection. (59) Hydralazine injection. (60) I forfamide injection. (61) Inactivated Rabies Vaccine (Prepared from culture of Rabies virus/Human diploid cells/purified chick embryo cells and viro cell line. (62) Indian 113 sterile generator and Elution Acessories: (1) Indium 113 in Brain Scanning Kit (2) Indium 113 in Liver scanning kit. (63) Mono component insulins. (64) Interferon Alpha 2b/Alpha nl injection. (65) Intravenous Amino acids. (66) Isofluri ine injection. (67) Lactulose Syrup. (68) Levodop a (L-Dopa) Capsules & Tablets. (69) Mustine Hydrochloride injection. (70) Measles, Mumps and rubella Virus Vaccine. (71) Meningococcal Vacine A + C combined Vaccine with diluent solvent. (72) Mannitol Busulphan Preparations, injection and Capsules. (77) Mitrotane tablets. (78) Netilmycin injection. (79) Pancuronium Bromide injection. (80) Penicillin injection. (81) Pentamidine I sothionate injection. (82) Polyestradiol Phosphate Vials. (83) Pralidoime Chloride/Iodide injection. (84) Prazocin tablets. (85) Procarbazine Hydrochloride capsules (86) Protamine sulphate injection. (87) Pyridostigmine Bromide injection/tablet. (88) Radio Pharmaceuticals: (1) Chlormerodin (197Hg) injection. (2) Gallium Citrate (67GA) injection. (3) Indium III in Bleomycin injection. (4) Sodium Phosphate (32p) injection. (5) Sodium Arsenate (74As) injection. (6) Strontium (85 Sr) Chloride injection. (7) L-Selenomethionine (75 Se) injection. (8) Thallium (2ol) injection. (89) tissue Plasminogen Activator injection. (90) Septopal Beads & Chains. (91) Solutions of Nucleosides and Nucleotides for injection. (92) Somatostatin injection. (93) Specific desensitising Vacline. (94) Sterile Absorbable Haemostat for control of Surgical vessel bleeding. (95) Streptomase-streptodornase Preparations. (96) Testolactone injection. (97) Thiogoanine tablets. (98) Ticarcillin Sodium injection. (99) Tobramycin Sulphate injection. (100) Tri-IDDO-Thyronine tablets & injection. (101) Urokinase injection. (102) Vasopressin injections and Spray. (103) Vindesine sulphate injection. (104) VN-26. (105) X-ray Diagnostic Agents, Namely: (1) Ethyl Iodophenylundecylate injection. (2) Iodipamide Methylglucamine injection. (3) Lipidoll ultra Fluid. (4) Patent Blue. (5) Propyliodone injection. (106) Zidovidine injection/Capsules.

New packaging law to hit Indo-German trade

The recent German packaging legislation, which makes it mandatory to use environment friendly packaging materials will affect the Indo-German trade in a big way, according to **Dr. D. Kebschull**, Coordinator, Indo German Export Promotion (IGEP) project.

The legislation, he said, was the result of a growing concern shown by most advanced countries to use only materials that can be re-cycled. Exporters would have to use either thin cotton bags or other bio-degradable materials acceptable to Western countries, he added. Many exporters are aware and are taking measures to overcome this obstacle so as not to lose their competitive edge in the European market, the IGEP chief said at a workshop on marketing and quality control for leather garments and goods at New Delhi recently.

The workshop was organised by the IGEP in collaboration with the Indo-German Chamber of Commerce (IGCC). Dr. Kebschull said that contrary to the reports appearing in the German press, the Indian leather industry has been able to overcome PCP (Pentachlorophenol) crisis to a very large extent. Recent laboratory tests in the South and Central India where there is a concentration of more than 60 per cent of tanneries have indicated that most of the leathers are either completely PCP free or within the permissible limit of 5 mg per kg, he said. The same applies for most of the reputed tanneries in the North and Eastern regions of India.

It may be recalled that the use of the PCP chemical had received wide publicity in Germany. After the discovery of carciogenic properties in the chemical, all products treated with the chemical above a certain level were rejected. This would have greatly affected India's leather products exports, but for the timely intervention of the Indian Government. A notification issued by the Ministry of Agriculture in June 1991 banned the use of the PCP chemical in India.

The demand by German importers for imposing stringent quality standards in the manufacture of leather garments and accessories necessitated the imparting of specialised knowledge to the Indian manufacturer exporters through such workshops. Also, the Indian leather industry has come of age and would now greatly benefit from such types of workshops, Dr. Kebschull said.

PLEXCONCIL EXCEEDS TARGET

The Plastics & Linoleums Export Promotion Council (Plexconcil) has surpassed its target of Rs. 260 crores for the period April 1991-March 1992 by Rs. 10 crores (provisional). Exports to General Currency Areas (GCA) increased by more than 35 per cent during the period under review. Exports to Rupee Payment Areas (RPA), however, fell sharply due to crisis in the erstwhile USSR and also on account of a delay in signing of the trade protocol with the Russian Government.

According to **Mr. A.H. Bharucha,** Chairman of the council, with increased availability of raw materials, exports of finished products would also go up. Efforts to export plastic products have been hampered by administrative bottlenecks such as delay in issue of advance licence, redemption of bank guarantees and also delay in the closure of DEEC books.

To promote exports the council has undertaken a number of activities —joint participation with Plastindia Foundation in K'92 exhibition, Germany and Arabplast exhibition in Dubai, says a press release issued by the council, at Bombay recently.

RISHIROOP RUBBER TO SET UP EoU

Rishiroop Rubber (International) Ltd., is promoted by Rishiroop Polymers Pvt. Ltd., and its associates to manufacture chlorinated rubber. Chlorinated rubber which is a synthetic resin was produced for the first time in India by Rishiroop Polymers in 1973, based entirely on indigenously developed process knowhow and technology. Rishiroop Polymers and associated companies have nearly 200 full-time employees at their three plants in Nasik and Maharashtra; two plants in Vapi, Gujarat and head office at Nariman Point, Bombay. With a well established base, Rishiroop Polymers group is poised for fast growth in various projects it has already taken up and likely to undertake in the future.

Rishiroop Polymers group of companies have so far been privately held. All the group companies have shown healthy growth rate and are profitable. In 1990, Rishiroop Polymers embarked on an ambitious programme to export chlorinated rubber to world markets. During 1990, it exported goods worth Rs. 16 million to countries such as USA, UK, West Germany, South Korea, Taiwan, Australia etc. In recognition of this effort, Rishiroop Polymers was awarded a "Certificate of Merit" from Chemicals and Allied Products Export Promotion Council in 1991.

RAO URGED TO CLEAR HALDIA REFINERY EXPANSION

The West Bengal Chief Minister, **Mr. Jyoti Basu,** has urged the Prime Minister, **Mr. P.V. Narasimha Rao,** to clear the Haldia Refinery expansion project. In a letter to Mr. Rao, Mr. Basu said since the proposed new refineries at Mangalore and Karnal had been delayed, it would be quicker and cheaper to expand the existing refineries.

Joint ventures for fertiliser in Bangladesh mooted

India is planning to set up gas-based nitrogenous fertiliser joint ventures in Bangladesh. A protocol to this effect is expected to be signed when the Bangladesh Prime Minister, **Mrs. Khaleda Zia**, visits India shortly.

Official sources at New Delhi said that Bangladesh is keen on exploiting its rich gas finds productively. Currently, the gas is merely being "capped". The fertiliser produced will be sold back to India under agreements that would be formalised bilaterally and through the joint ventures. Also to be explored would be 'passage rights" to India through Bangladesh of nitrogenous fertiliser that is proposed to be produced in gas-based units in Tripura.

Modalities for setting up the units in Bangladesh are yet to be worked out. In every probability, the agreements will include capital participation and technology transfers. One point of contention, however, will be over who would hold management control over the units. The Bangladeshis were reported to have expressed a desire to keep management control under them. But it is quite likely that a joint management plan will be worked out ultimately. The number of units to be set up will depend upon the amount of gas made available by Bangladesh.

In Tripura, the government is drawing up ambitious plans to set up three gas-based mega fertiliser units. The Department of Fertilisers, in fact, is pushing Tripura as a greenfield site for some of the biggest investments in fertilisers in the coming years following the Petroleum Ministry's indication that no new gas-based units will be allowed to come up along the Hazira-Bijapur-Jagdishpur gas pipeline.

The three units will be capable of producing upto 2.25 to 2.50 million tonnes of urea and are expected to cost Rs. 1,200 crores apiece. The major problem with the fertiliser to be produced in Tripura will be the transportation bottleneck.

But if a passage is available via Bangladesh, through the waterways, then the cost of transporting it to the Indian hinterland will be within the reasonable limits. This will immediately make the units viable. Transportation through rail via Bangladesh will also be another option.

In both cases, Tripura will be as far away from the demand centres as, for example, is the Hazira unit of Kribcho. Earlier, plans were to export fertiliser from Tripura to China, via Bangladesh. But this option is now being discounted following the escalating demand-supply gap that is expected to come up in nitrogenous fertilisers in the coming years.

India is expected to become a major importer of urea in the international markets in the next few years, with major imports already underway in 1992-93. In this context, it has been found prudent to cultivate captive sources of urea supplies.

The Bangladesh and Tripura options thus look attractive. As far as Tripura is concerned, among those who have evinced interest are the R.P. Goenka group, the public sector National Fertilisers Ltd., and Krishak Bharati Cooperative Ltd.

KAVERI ENGINEERING BAGS ORDER FROM TATA FERTILISERS

Kaveri Engineering Industries Ltd., at Tiruchirapalli has bagged a major order from TCL for two 5,000-tonne double value integrity type ammonia storage tank with independent systems on a turnkey basis.

The two systems are for Babrala fertiliser complex of Tata Chemicals Ltd. in Uttar Pradesh. Kaveri bagged this order under international competitive bidding.

Ammonia storage and handling has been a strong forte of Kaveri. Kaveri started initially with cylinders of capacities of 70 kgs and containers of 500 kgs to 7 tonne road tankers, 26 tonne rail tankers, etc.

With the Swedish collaboration (Udcomb AB, Sweden) Kaveri launched the manufacture of pressure storage spheres, and today the company is well known for manufacture and erection of spheres.

The largest so far erected sphere was for Goa fertiliser complex with 21.5 m diametre. It was with these achievements the drive for entering larger and varied areas of ammonia storage and handling gained momentum.

Kaveri started with an order for 500 tonne ammonia storage, holding and handling system for ammonium sulphate caprolactum project in Cochin. This was followed by an order for two ammonia storage tanks for Nagarjuna Fertilisers and Chemicals Ltd., Kakinada, in Andhra Pradesh which will be commissioned soon.

BIOSENSE CROP

Biosense Crop Protection (India) is setting up a project for the manufacture of biological products for protection of crop from insects and diseases. The products will be manufactured in technical collaboration with companies like Russell Fine Chemicals and Technoverde Ltd. of UK.

The company is promoted by Good Value Marketing Co. Ltd. To part-finance the project, the company plans to enter the capital market with a public issue of Rs. 8.97 crores.

All-round hike in steel prices announced

The three main producers have finally marked up steel prices after waiting, much against their wishes, for four months since the Union Government decontrolled steel prices and substantially withdrew distribution regulations with effect from the midnight of January 16/17.

Effective from midnight of May 18/19, pig iron and steel produced by Steel Authority of India Ltd. (SAIL) and Rashtriya Ispat Nigam Ltd. (RINL) —the latter the corporate entity for Vizag Steel — will be dearer. While SAIL is still busy working out the item-wise prices, the extent of increase is being put at 15 per cent in relation to the existing sale value.

The exercise is not so complicated for RINL because its present saleable mix consists of only two items — wire rod and pig iron. But RINL is following its senior PSU partner and rival, SAIL, in every respect. Perhaps, not being sure as to when SAIL and RINL will post higher prices despite the broad understanding that emanated from informal consultations on May 13 and 14 in New Delhi, Tata Steel posted higher prices a day earlier, that is, from the midnight of May 17/18.

Tata Steel has announced a mark-up that averages Rs. 1,800 per tonne. It is learnt from reliable sources that the quantum of average increase being affected by SAIL and RINL may finally work out slightly on the lower side. One possible reason can be traced to pig iron, a low-value item that figures in the saleable mix of SAIL and RINL but not Tata Steel. Reports say that pig iron prices are being marked up by Rs. 750 per tonne.

Although Tata Steel raised prices a day earlier, enquiries suggest that its exercise on item-wise prices is still not over. Further, while for certain items there is no hike and for certain items the increase is much lower at, say, about Rs. 300 and about Rs. 700, generally the increase ranges between Rs. 1,500 and Rs. 2,200 per tonne. The company, is stated, has attempted to rationalise the pricing mechanism and remove the abberations of the pre-decontrol Joint Plant Committee pricing format by merging all extras on account of size, section and quality. SAIL and RINL, perhaps, attempt a similar rationalisation later.

As for SAIL's products, as on all previous occasions, the quantum of increase for flat items (HR sheets/strips/coils, CR sheets, GP/GC sheets and plates will be much more than that in respect of long products — mainly structurals — light and medium). Although following the decontrol of prices in January last, the main producers are free to decide on the pricing mechanism that they would like to be prevalent and make approximate changes, it appears they did take the Steel Ministry into confidence before exercising their right.

In fact, it is because the Centre —particularly the Prime Minister **Mr. P.V. Narashima Rao,** — did not want them to immediately take advantage of the decontrol that they have had to restrain themselves for four months. This is in spite of the fact that well before the Union government announced the decontrol/deregulation decision on January 16 last, they had built up a case for hiking prices by over Rs. 1,000 per tonne.

In fact, they were then looking forward to the Centre's green light. The mark-up effected will compensate the producers against the factors contributing to cost escalations since the last upward revision, under the administered price regime, in September 1990. These include higher coal prices, higher electricity tariff, costlier imports following devaluation of rupee and the impact of two instalments of railway freight hike (10 per cent in the 1991-92 Budget and 7.5 per cent plus another almost five per cent due to classification change in the 1992-93 Budget) on inward movement, that is, raw materials going into the making of steel.

Usually, between four and 4.5 tonne of raw materials go into the production of one tonne of steel. As far as consumers are concerned, this is the third time in this fiscal year that steel has become dearer for them. The first increase immediately followed the Budget which incorporated significant changes in excise duty — specific rates for long products were hiked, rate of special excise was raised and ad valorem concept was introduced for flat products with varying degrees of value-addition.

In fact, the impact of the last-mentioned change was quite substantial. Then, with effect from April 1, the railway freight element was jacked up by Rs. 124 to Rs. 1,080 per tonne for steel and by Rs. 85 to Rs. 730 per tonne for pig iron. And now comes the straight increase in steel prices.

LLOYDS STEEL PLANS Rs. 200 CRORE ISSUE FOR FUNDING EXPANSION

The directors of Lloyds Steel Industries Limited (LSIL) have proposed to issue fully convertible debentures (FCDs) to the tune of Rs. 200 crores on rights basis, subject to the consent of the controller of capital issues and other necessary approvals.

The main object of the issue is to part-finance the expansion of steel project at Wardha by which its production capacity of hot rolled coils/strips (HRC) will be increased to 4 lakh tonnes from the original level of 1.50 lakh tonnes per annum (tpa). The company has also entered into the field of design, manufacture, supply and erection of sponge iron plants on turnkey basis. The revised cost of the four lakh tpa HRC plant is estimated at Rs. 626.50 crores.

Coal India to enforce strict fiscal discipline

Encouraged by the all time high record achieved during 1991-92, Coal India Limited (CIL), has taken steps to ensure effective and result oriented utilisation of available resources to emerge as a permanent economically viable and commercial organisation. With CIL having the capital of more than 47 million tonnes of coal piled at pitheads of coal mines, it is confident of touching the new heights.

For this, steps have been initiated to enforce strict fiscal discipline in 1992-93 and utilise the resources for priority implementation. The quest is for gainful utilisation of money to be spent with specific purposes.

The major objective of deciding the priority areas for investment well in advance during the year, is to give the company a shape of an economically sound and commercially effective organisation, according to CIL sources.

The departmental heads at CIL headquarters have been asked by the Chairman, **Mr.S.K. Chowdhury,** to work out the priorities for each section by involving everybody employed in the departments to have a consensus decision.

The priorities have been decided based on the jobs assigned to each section. The infrastructures available with them have also been taken into account. With finalisation of such priorities, the performance of departments will not be reviewed by the end of the year, but will be a monthly affair henceforth.

As part of economic measures, CIL units will have to generate their own basic operational expenses. The effective utilisation of machineries and man-power will be another area of importance under the thrust plan undertaken.

Achieving total economic salvations and self-reliance is the motto behind the decisions in respect of priorities finalisations. The company is well set to exercise means and methods to ensure the maximum benefit out of each rupee to be released from the CIL exchequer during the year, the sources said.

The austerity plan and economic measures implemented in 1991-92 will continue during the current financial year. The areas identified as unproductive items under austerity plans are air travel in masses for training and other allied functions. The near total ban will continue on meetings and seminars in five star hotels etc. Institutional advertisement meant for image building has also been banned during the year.

To manage the implementation of these decision a new cell will be made operative within the finance directorate of CIL at Calcutta, the sources said. The priorities in the field of technical arena too have been decided.

This includes the energy conservation, effective utilisation of machineries, equipments, spares and total infrastructural facilities available with Coal India Limited.

The production of coking coal will continue to be a main thrust area during 1992-93. CIL will also take care to initiate long term measures for tackling the mine fire at Jharia and finding out the social and technical solutions to the subsidence problems at Raniganj in an intense manner. Priority will be given to the safety aspect of mines and the resources crunch will not affect this under any circumstances, the sources said.

Another priority area will be the environmental protection throughout the coalfields in the country. For the purpose of achieving the authentic documentations of king coal in the country the publication of an authentic coal atlas has been planned. This will be made to match with such other publications throughout the world, the sources said.

PIB CLEARS 2 PROJECTS TO REDUCE GAS FLARING

The Public Investment Board (PIB) has cleared the Rs. 3,271 crore project for setting up the second Bassein-Hazira gas trunkline and expansion of shore terminal facilities at Hazira as well as the Rs. 704 crore project for laying the ICP-Heera trunk pipeline. The two projects form part of the composite gas flaring reduction project of the ONGC in the western offshore. The first two components of this project — L-II and L-III — have already been approved by the government.

The foreign exchange component of the Bassein-Hazira project is estimated at Rs. 2,380 crore and that for the ICP-Heera trunk line at Rs. 574 crore. Officials said that in view of the urgent need to eliminate wasteful flaring of natural gas, the PIB, presided over by expenditure secretary **Mr. K.V.R. Nair,** has granted expeditious approval to these projects. Both projects have been posed for funding as part of the gas flaring reduction project to several multilateral agencies, including the World Bank and the ADB.

The foreign exchange component of the Bassein-Hazira project is expected to be met from the total loans tied up for the composite project. These include a World Bank loan of $450 million, ADB loan of $250 million, combined Japanese credit of $350 million and suppliers' credit or commercial borrowings. The rupee component will be met through the ONGC's internal resources.

A provision of Rs. 100 crore has been made in the 1992-93 annual plan for this project. In addition, an outlay of Rs. 2,000 crore has been recommended for it in the Eighth Plan. In the case of the ICP-Heera trunkline, the financing pattern will include ADB loans of about $120 million, suppliers credit of $72 million and the balance through the ONGC's resources.

Coal Mines Act being amended to allow private participation

The Coal Mines (Nationalisation) Act is being amended to allow private participation in setting up coal washeries and also for captive coal mines in the private sector for power generation. Giving this information while presiding over the meeting of the Consultative Committee of Members of Parliament attached to his Ministry, the Minister for Coal, **Mr. P.A. Sangma,** said, this would boost private investment and help augment coal production and availability.

The Minister, however, added that the private sector participation would be according to the mine plan approved by the Ministry and subject to strict supervision of the Coal Controller to ensure safe and scientific mining.

He informed the Committee that coal production reached 204.14 million tonnes which was 11.40 lakh tonnes more than the target and 14.49 million tonnes over last year's output. Declining trend in underground production was reversed, he said and added that 193.8 million tonnes of raw coal was despatched to various sectors exceeding the target by 3.1 million tonnes. Average loading of wagons had increased from 13,330 to 14,344 per day, Mr. Sangma told the Committee.

He also informed that Coal India was expected to earn a profit of over Rs. 100 crore as against a loss of Rs. 253 crore last year. Similarly, the collection from coal sales was higher by Rs. 989 crore than the previous year. Due to capital expenditure control, Rs. 585 crore was saved, he told the Committee.

The Minister also informed the Committee that each company would draw up an emergency plan to supply water during the summer months and would also draw up short and long term plans to further improve the water supply situation. The Minister told the Committee that a suggestion had been received that 70 per cent of the surplus staff be deployed in the new mines and the remaining jobs may be given to the local population.

COAL MINISTRY PEGS DEMAND AT LOWER THAN PLANNING COMMISSION LEVELS

The Coal Ministry and the Planning Commission hold different views on the assessment of the demand for coal during the Eighth Plan period, according to Ministry sources. The Coal Ministry's estimates for India's raw coal demand in the current year — the first year of the Eighth Plan — is 247.30 million tonnes, the sources said. The Planning Commission, however, has indicated a demand of 254.5 million tonnes, which is 7.2 million tonnes higher than the Ministry's estimates. The estimates also differ for the terminal year of the plan, 1996-97. The Ministry is in favour of planning for a demand figure of 307.50 million tonnes while according to the plan panel, the demand would go up to 309.2 million tonnes by the end of the Eighth Plan. A correct and realistic assessment of the demand for coal, the country's prime source of energy, is important to enable the coal producing companies to plan correctly for their production, the sources said. The demand for power grade coal was met by domestic production, though for coking coal some imports were necessary to fill the demand-supply gap. The Ministry projected a production plan of 237.09 million tonnes for 1992-1993 and 293.21 million tonnes for 1996-1997. The balance requirement would be met from drawals from the pithead stocks and for reasons of safety and security it was not advisable to build up an unmanageable stock of coal, the sources pointed out.

Substantial increase in natural gas supply in '91-'92

There has been substantial increase in the supply of natural gas during 1991-92 to about 12 billion cubic metres as against 7.6 billion cubic metres in 1990-91, according to the annual report of the Ministry of Petroleum and Natural Gas.

The report says, however, the production of crude oil in 1991-92 dropped to about 30.34 million tonnes as against 33.0 million tonnes in 1990-91. The Oil Industry had set a target of enrollment of 10 lakhs new LPG customers during 1991-92. During 1991-92, a zero growth was planned and maintained in the allocation of kerosene to States and Union Territories.

The public sector undertakings in the oil sector during 1990-91, earned Rs. 2,814 crore of profit before tax and Rs. 2,302 crore profit after tax. The profit before and after tax during 1991-92 is estimated to be Rs. 2,546 crore and Rs. 1,765 crore respectively, the report said.

The net internal resources generated by the public sector undertakings in the oil sector during 1990-91, which were available for meeting the plan expenditure, were Rs. 3,021 crore. During 1991-92 an amount of Rs. 2,635 crore is expected to be generated internally by these companies for meeting their plan expenditure.

The price of natural gas has been revised with effect from January 1, to Rs. 1,550 per thousand cubic metres at landfall point or well head. The price of gas in the northeastern region was, however, maintained at Rs. 1000 per cubic metres but the discount available on this price on a case to case basis was revised to Rs. 400 per thousand cubic metres. According to the report, in onshore areas, 33,673 line kilometres of seismic surveys are expected to have been carried out during 1991-92 as against the target of 21,350 line kilometres of departmental work and 4,920 ground line kilometres of contract work.

During the year, the Ministry negotiated and finalised several loans from multilateral agencies for the development of the hydrocarbon sector and for certain projects of ONGC.

A loan of $267 million was negotiated and finalised with the Asian Develepoment Bank (ADB) for the Gandhar oilfield of development project of ONGC and further, a loan of $250 million as hydrocarbon sector programme loan was negotiated and finalised with the Asian Develoment Bank.

The report said some States and Union Territories had been for a long time urging the Government of India for allocation of kerosene to them on uniform basis throughout the year.

A decision has been taken to allot kerosene to 18 States and Union Territories on a uniform basis as sought for by them. The remaining states and Union Territories have, however, been allowed to get kerosene on a blockwise basis as per their requests, it said.

The demand of LPG for domestic purposes has been rising at a rapid pace. The all India waiting list for new connections which was around 70 lakhs as on April 1, 1991 has gone up to around 85 lakhs as on January 1 this year. The government is making all possible efforts to provide maximum possible number of connections.

The target of LPG connections and double bottling facilities for 1991-92 which was earlier fixed at 5 lakhs and 5 lakhs respectively was enhanced to 10 lakhs respectively.

SHORTFALL IN IMPORTS FROM RUSSIA:

Crude supplies from other republics being explored

Faced with the prospects of Russia backing out of its commitments to export crude and petroleum products worth $650 million to India during the current calender year, the Union Government is exploring the possibilities of making up the shortfall from other republics of the former Soviet Union.

According to official sources, efforts are being made to bring about supplies of crude and petroleum products from other republics such as Kazakhastan and Azerbaijan to be paid for by export of goods from India.

While Azerbaijan has expressed its inability to supply any crude, it has expressed its willingness to export petroleum products to India. It has asked the Union Government to indicate its requirement of petroleum products for 1993 by September/October this year.

A trade plan signed with Kazakhastan recently envisages the import of one lakh tonnes of HSD during 1992. The contract for the same is yet to be signed and the supplies are yet to commence.

The Trade Protocol for the calender year 1992 with Russia on February 22 envisages supply of four million tonnes of crude, 0.6 million tonnes of diesel and 0.5 million tonnes of kerosene, all together worth about $650 million.

The apprehension about the Russians not honouring their commitment on this count are based on the fact that so far no contract between Indian Oil Corporation (IOC) and the Russian companies dealing in crude and other petroleum products has been signed. As a result, no supplies have actually been received from Russia, notwithstanding the repeated resolve on its part to do so, though almost half the year has already run out. In fact, the Union Government had taken up the issue with a highpowered Russian delegation which had visited India recently. The delegation included the Russian Minister for Fuel and Energy. Another delegation consisting of oil-producing enterprises of Russia is slated to visit from May 18 to discuss the modalities of supplying oil to India.

Russia has, however, agreed to supply 60,000 tonnes of crude during the current month. This cargo has been offered on the same terms and conditions as were applicable for the term contract with M/s. SNE for 1991.

The setback of this cargo works out to be negative (-$0.50/bbl) based on the price prevailing on April 29 this year. But this supply, according to official sources, would have the advantage of rupee payment. The shortfall in the supplies envisaged in the Trade Protocol will have to be made good from the other republics of the former USSR, term suppliers and spot market in hard currency.

According to informed sources, the Russian enterprises dealing in crude and other petroleum products are reluctant to deal with India because they have not received payments totalling Rs. 1500 crores from their National Bank which is believed to have utilised the money for some other purpose.

Meanwhile, while making efforts to resolve this tangle of pending payment, the Russian Government is learnt to have extended certain incentives to its oil-producing enterprises to encourage them to undertake exports to India. Some of such incentives are: abolition of export tax on exports to India, allowing the export to be made through their commodity exchange system and providing some additional financial incentives.

THERMAL POWER PLANTS

CEA clears 1,202-cr modernisation plan

The Central Electricity Authority (CEA) has cleared the Rs. 1,202-crore second phase rehabilitation and modernisation (R & M) scheme for thermal power plants.

Power Ministry sources said the green signal follows the beneficial impact of the first phase of the scheme, which was completed during the Seventh Plan period.

The second phase, involving a World Bank assistance to the tune of Rs. 68 crore, would help to improve the performance of 174 units aggregating a capacity of 18,706 MW, the Ministry sources said.

The 46 schemes of thermal power stations, cleared by the Central Electricity Authority, form bulk of Rs. 1,328-crore scheme, to be implemented during the Eighth Plan period. The six remaining schemes, covering 27 units and involving an investment of Rs. 127 crore, are under Central Electricity Authority's examination, the sources said.

The R & M scheme was launched in the Seventh Plan with the objective of achieving optimum performance from the old thermal units, and there was remarkable improvement in performance in some of the units where substantial R & M works had been carried out.

The plant load factor of some of the units, like the Badarpur Unit-I of the National Thermal Power Corporation, increased from 48 per cent before renovation to 75 per cent after substantial renovation.

In the first phase, work in 164 units, aggregating a total thermal capacity of 13,585.5 MW, was taken up, with an investment of Rs. 1,083 crore.

Between April and December 1991, 12 power stations achieved a higher plant load factor than the all-India average of 53.4 per cent, the sources said. These include the West Bengal Power Development Corporation, which had a plant load factor of 64.1%, the Calcutta Electricity Supply Corporation with 57.7 per cent and the Ahmedabad Electricity Corporation with one of the highest plant load factors of 68.3 per cent.

In the central sector, Singrauli super thermal power station of the NTPC, achieved the highest plant load factor of 75.6 per cent during the April-December 1991 period.

NEED FOR NATIONAL POLICY ON CERTIFICATION STRESSED

Even after India's adoption of international standards for quality systems, its implementation remains tardy in the absence of a clear cut national policy on certification.

Months after the launch of the IS:14000 series, the quality system standards by the Bureau of Indian Standards (BIS), there has been no significant response from industry despite the Government hype on the need for improvement in the quality of Indian products, particularly export products. The dim awareness of the concept of quality in industry and services sector has not helped the BIS's programme either.

Further, those in the industry who are aware of the importance of a quality systems certificate have made a bee line to the apex industry associations connected with foreign certifying bodies to obtain the ISO 9000 certificate, considered a pre-requisite for enhancing export competitiveness in many countries. Though the IS:14000 series are an identical copy of the ISO 9000, the Indian version is yet to take-off particularly because of the number of agencies, both from the private and public sector tying up with foreign certifying bodies.

APPOINTMENTS

Industry urged to update quality

The Planning Commission Deputy Chairman **Mr. Pranab Mukherjee** asked the Indian industry to attain the quality of international standards in their goods and services so that the country could achieve a higher growth rate in exports.

Inaugurating the National convention on 'quality for survival' at New Delhi, he said Indian industries, business and services had not only to raise the level of their performance in terms of quantity but attain a quantum leap in terms of quality. In this regard, a total re-look at the whole issue of quality was necessary to establish India's place in the world market and attain a favourable balance of trade.

It would be balance of trade ultimately which would give stability to Indian economy, he said. Mr. Mukherjee said the era of market friendly approach for development had begun in India. It was necessary to aim at higher exports to tackle the balance of payments problem. The need of the hour was to become internationally competitive both in price and quality, he added.

Referring to the need for meeting challenges from the world market by adhering to strict quality control, Mr. Mukherjee emphasised that a total commitment was needed to change 'cultural' attitudes in the industry, trade and commerce for running these organisations under the purview of the quality umbrella.

'A team work for total quality is an essential component of this systematic approach to quality management', he said adding 'we must aim at building such a system as a matter of both strategy and action plan in the 1990s. He also suggested that the audit of quality control performance might be considered a measure of management effectiveness.

In this context he said, since too many people were busy getting things done there must be some mechanism which would ensure how well things were being done.

Therefore, he explained quality audits were necessary and must be carried out as an important management function. Referring to India's struggle to make a dent in the international market, he said, it is in the fitness of things that we should have an introspection and plan seriously to take corrective measures.

Against this backdrop, he said quality management systems should widely be adopted to get consistent quality of goods and services acceptable in the global market. Mr. Murkherjee said universalisation of quality standards had become a necessity in the light of emerging international economic environment of competitiveness. There was a need for standardisation as an important step to quality control programme.

Standards at national level in most of the developed countries were fairly well advanced and a large number of standards had been published. He also said that the Eighth Plan provided a unique opportunity to evolve a long-term strategy and prepare a comprehensive action plan for achieving significant improvement in the quality of goods and services under a time bound action plan.

The quality control system must be dynamic and constantly adapt to the changing needs, he said. The national convention was organised jointly by the Human Resource Development Foundation, Bureau of Indian Standards and Standing Conference on Public Enterprises. Standing Conference on Public Sector Enterprises (SCOPE) Chairman **Mr. Moosa Raza** said we have made our policies clear.

The declaration of new policies is declaration of intent, which is to integrate with the world economy. The gap however, is quality and competitiveness. In the coming years the challenge as the country advances will be to improve the quality of goods and services.

Quality consciousness must percolate to the last person, he said. Mr. Raza said with the economic integration of Europe, the standards which will prevail in most countries will be world standards. "We must give up national standards as national standards will cease to have any meaning", Mr. Raza said.

KSIDC TO MAKE COMPILATION OF PROJECT PROFILES

In an apparent bid for a giant leap forward in the field of industrialisation, the Kerala State Industrial Development Corporation (KSIDC) has launched a plan to woo private investment which among other things includes a multi-pronged marketing campaign, a shelf of ready-made project profiles in consultation with internationally accepted consultants, a technology bank etc.

Addressing a press conference at the KSIDC head office in Thiruvananthapuram on May 12, the Kerala Minister for Industry, **Mr. P.K. Kunjali Kutty** disclosed that an amount of Rs. 1 crore has been set apart for the marketing campaign alone. He informed that the campaign with a view to attracting private entrepreneurs was already on.

The interface with industrialists in New Delhi a couple of months back was part of the campaign. Similar meetings are proposed in other major cities. The next one is to be held in Bangalore sometime next month.

As suggested by captains of industry at the Delhi interface, the Kerala government is organising a shelf of ready-made project profiles. Of these 50 will be prepared by KSIDC, 30 by technopark in Thiruvananthapuram and a few others by internationally accepted consultants.

CAG indicts DNES for improper use of funds

The Comptroller and Auditor General has criticised the Department of Non-conventional Energy Sources (DNES), for what it termed a "string of failures", leading to a loss of several lakh rupees.

At least four major projects — installation of solar dryers, production of alternate fuel from agro-wastes, setting up of a cold-storage plant using geothermal energy and solar water pumps —have shown no results to speak of, CAG said in a report tabled in Parliament recently. In March 1984, DNES entrusted to the National Industrial Development Corporation (NIDC) a Rs. 20 lakh project to set up solar dryers at Rae Bareilly, Sultanpur and Sonepat in a year.

The installations were not completed even after doubling the funds and the time and the slashing of the plant size. Five years later, NIDC quoted still higher costs for setting up the units and DNES decided to cancel its order. Out of the Rs. 41 lakhs released by the Department of NIDC, for the project, the latter refunded only about Rs. 38 lakh, retaining over Rs. 3 lakh, the report said.

It pulled up DNES for not only failing to set up the plant but also for releasing substantial resources as interest-free advances without first assessing the techno-economic feasibility of the project. Similarly, DNES paid over Rs. 1 crore to the Indian Institute of Technology, Delhi, between 1985-86 and 1991-92 to set up a pilot plant to produce ethyl alcohol as an alternative fuel from agricultural wastes. DNES went ahead with the project despite experts' doubts over its commercial viability and the recommendation of the Commission on Additional Sources of Energy (CASE) that the "project was not worth pursuing".

IIT awarded the contract to a foreign firm for a pilot plant even before the proposal had been examined by the technical advisory committee on liquid fuels, the report said. The imported plant was commissioned, irrespective of the fact that it was better suited to processes developed abroad and not to indigenous processes and materials.

'CASE has taken a dim view of the entire matter which indicates the need for the Department to look into the competence, resource personnel and progress in IIT..." so as to decide on the plant's feasibility earlier than May 1994, the report said.

Solar thermal pumps that were to be installed and demonstrated in field trials by a public sector undertaking in a DNES project fared no better. After a pump was installed three years behind schedule at Jaipur in 1989, it was found during trial runs that a lot of mud came in with the water.

When the pump was operated, mud accumulated in the condenser tubes. Also the borewell did not have adequate water and the system could not be commissioned.

The pump was finally dismantled by the public sector undertaking in June 1990 and transported to Rudrapur last year. The dismantled pump is yet to be installed elsewhere.

The Department later stated that resources were not wasted as its objective was to gather performance data. "The Department did not indicate the plan for installation at any other site to achieve its primary objective of field demonstration, apart from the secondary objective of collection of performance data", the report concluded.

Revamp of pollution control boards through World Bank assistance

A Rs. 670 crore World Bank scheme is being launched to improve the technical, financial and the staff position of the state pollution control boards. The cabinet has granted its approval to the project, according to an official release.

This was stated by Minister of State for Environment **Mr. Kamal Nath** at the concluding session of the national workshop of non-government organisations (NGOs) engaged in environmental promotion. Mr. Kamal Nath said his Ministry was considering appointing special environment officers from among the environment activists, on the line of the special police officers.

The Minister also announced the setting up of a special NGOs division in the Ministry to coordinate with other departments. He said the Department of Personnel is being asked to include an environment component in the various training courses for government officials.

Mr. Kamal Nath said he had been in constant dialogue with the NGOs during the last eight-nine months, which had been extremely helpful in formulating India's stand on various global environmental issues before the Earth summit.

Reacting to a suggestion on environmental films being telecast on Doordarshan, he said after discussions with the Information and Broadcasting Ministry it has been decided to constitute a joint committee of the two Ministries to preview the film before approving their telecast. The four different groups constituted at the beginning of the workshop gave their recommendations on the pollution control, wasteland development and afforestation, environmental education and awareness and the issues before the United Nations Conference on Environment and Development.

No patents on life forms

The group on global issues recommended that India take a stand that there should be no intellectual property rights on life forms and bio technology.

It said that current trade patterns are one of the root causes of the eco distortions and these should be modified. It recommended that the countries affected by trans-boundary environmental effects be compensated by the international community.

Carrying capacity study necessary

The group on pollution suggested that the carrying capacity of industrially saturated places should be studied before clearing more projects to be set up at these places. It also said that the railway wagons carrying coal to the thermal plants should carry back the flyash to be dumped into the empty coal mines.

BANGRI MINERALS TO EXPAND

Bangri Minerals and Chemicals Ltd., engaged in processing ultramarine minerals silicate filters, is expanding its capacity setting up new and modern facilities. To part finance the expansion, the company is entering the capital market with a public equity issue.

Mr. B.M. Bangri Promoter-Director, is a post-gradute in business management from Jamnalal Bajaj Institute of Management Studies. He has a vast experience in the field of financial management and planning. The company is primarily in the manufacture of fillers, extenders, diluents, etc. These products are essentially processed minerals like clay, buaxite, calcite, diaspore, kaymite, pyrophilill and talc which give body to formulations. The company's expansion programme is estimated to cost a total of Rs. 12.40 crores.

Ministry projects easier availability of steel by Eighth Plan end

The gap between demand and supply of finished steel will be halved towards the end of the Eighth Plan, when the on-going liberalisation measures are expected to start paying off.

In 1996-97, demand will exceed supply by 0.91 million tonnes, down from the current 1.8 million tonnes. Significantly, contribution in a big way will be by the secondary producers whose production will nearly double during the period under review. According to projections of the Ministry of Steel, the secondary producers will chip in with 11.03 million tonnes in the terminal year of the Plan as against 6.27 million tonnes at present.

Main producers, during the same period will be able to raise their production levels to 13.06 million tonnes from the present 8.3 million tonnes. Among the main producers, Vishakhapatnam Steel Plant will account for the largest improvement in production from the current 395,000 tonnes to 2.16 million tonnes by 1996-97, while Bokaro is expected to increase output by nearly ten lakh tonnes from its current 2.56 millon tonnes.

TISCO, meanwhile, would improve its performance to touch 2.16 million tonnes from 1.21 million tonnes at present. Total demand for finished steel has been estimated at 25 million tonnes in 1996-97 as against 16.35 million tonnes in 1991-92. However, industry sources point out such a procedure may not reveal the true picture for steel supplies have always been geared to meet demand projections that are based on historical consumption patterns to basic industrial raw material without taking into account either actual or potential demand.

Use of historical data to estimate future demand of finished steel tends to give an incorrect picture, for, it reflects a situation where demand is constrained, which is a consequence of low production and controlled imports. According to industry sources, the complete absence of public investment in steel for export purposes also has greatly hampered the country's production.

Instead, efforts have been aimed at selling primary products and minerals like most developing countries do. Given that about 100 million tonnes of steel is traded annually in the world and that major steel producing nations export roughly 25 per cent of their produce, there is good scope for export of iron and steel provided, they meet international quality standards at competitive prices.

The per capita consumption of steel — at 20 kg — in the country, thus remains amongst the lowest in the world. China, whose performance is often compared with that of India, is miles ahead with a 64 kg consumption per capita. In the developed countries the comparative figure varies between 600 kg and 700 kg.

In the case of pig iron, however, there will actually be an excess supply of 0.1 million tonnes with demand pegged at 3.03 million tonnes. Of this, the main producers would account for about two-thirds, the balance coming from the secondary sector.

In 1991-92, the latest year for which figures are available, demand has been computed at 1.92 million tonnes while the country's actual production was only 1.44 million tonnes. Imports bridged the gap.

STEEL OUTPUT MAY INCREASE BY 8 PER CENT

Production of saleable steel in the five integrated steel plants of the Steel Authority of India Ltd. (SAIL), during 1991-92 is expected to be about 7.95 million tonnes — an increase of eight per cent over the previous year. According to the annual report of the Ministry of Steel for 1991-92, the production at the Visakhapatnam Steel Plant was about 1.2 million tonnes of hot metal.

The secondary producers produced about 3.5 million tonnes during the year as against 3.86 million tonnes in the previous year. Total production of saleable steel in 1991-92 is about 14.15 million tonnes — 7.3 per cent more than the previous year.

According to the report, the total demand for finished steel in 1991-92 was 16.35 million tonnes as against the domestic availability of 14.55 million tonnes, leaving a gap of 1.8 million tonnes.

The domestic availability of pig iron was estimated at 1.44 million tonnes as against a demand of 1.92 million tonnes. The import of finished steel in 1991-92 was to the tune of one million tonnes and that of pig iron 1.5 million tonnes.

Tata Iron and Steel Company Limited (TISCO) is expected to produce 2.05 million tonnes of saleable steel in 1991-92 as against 1.94 million tonnes in the previous year, the report says.

TISCO is now poised to complete its phase III modernisation by 1994, which would increase its saleable steel production to 2.7 million tonnes per annum. TISCO is also installing a modern one-million-tonne per annum capacity blast furance.

Iron ore production, which is 50 million tonnes at present, is expected to go up to 72 million tonnes by the end of the Eighth Plan. Iron ore export is expected to touch 36 million tonnes by 1996-97 — a million tonne more than now. Production of finished steel will go up to 20.90 million tonnes by the end of Eighth Plan from the present level of 14.60 tonnes.

HZL castigated for functioning of phosphoric acid plant

The Comptroller and Auditor General (CAG) has pulled up the Hindustan Zinc Ltd. (HZL), for time and cost overruns in the execution of various projects undertaken by the company from time to time. In his report on HZL, the CAG said that the delay in completion of projects necessitated revision in the estimated costs from time to time.

Citing instances, the report said, the cost of Balaria mine project increased from Rs. 1,161 lakhs in September 1973 to Rs. 2,167 lakh in October 1977 and there was a time overrun of 10 months. The CAG also criticised the HZL for executing the Rajpura-Darbia mine project without proper engineering study. It noted that various activities were not synchronised properly.

As a result the cost of the project increased from Rs. 44.25 crore in February 1977 to Rs. 78.30 crore in 1984, "mainly on account of omissions of items in the detailed project report, modification in the space of work and under-estimation of quantities". Besides, there was time overrun of 18 months, the report said.

The CAG report pointed out that the cost of Sargipalli lead mine project of the HZL escalated from Rs. 1,188 lakhs in January 1979 to Rs. 2,092 lakhs in July 1987. The actual cost of the project was, however, Rs. 2,061 lakh and the time overrun was one year.

The CAG rapped the HZL for launching the Maton rock phosphate mine, whose cost estimates increased from Rs. 234 lakh to Rs. 661 lakh due to inclusion of slurry pipeline and other escalations.

The single super phosphate plant which uses rock phosphate virtually remained closed from 1988-89 since this plant was being operated only when the smelter had problems of disposal of sulphuric acid or of operation of phosphoric acid plant, the report noted.

It said the production of phosphoric acid plant which also uses rock phosphate was "negligible" and the company, therefore, sold rock phosphate at a loss which amounted to Rs. 1.73 crore during nine years ending on March 31 last year. In this context, the CAG report said, the purpose of operating rock phosphate mine was 'defeated'.

The CAG criticised the HZL for installing the residue treatment facilities at the Debari smelter in April 1985 at a cost of more than Rs. 18.91 crore with a cost overrun of Rs. 849.68 lakh and time overrun of 22 months.

In his report, the CAG said with a view to recovering zinc locked in leached residue and improving the zinc recovery in Debari smelter, HZL set up the residue treatment facilities but the guranteed recovery had not been achieved.

Similarly, the CAG castigated HZL for the increase in cost of Vizag Zinc Smelter project from Rs. 2,124.19 lakh to Rs. 4,689 lakh and that of Vizag Lead Smelter expansion from Rs. 620 lakh to Rs. 862 lakh. The CAG in his report pulled up the company saying in most of the mines as well as smelters the targets fixed were below the installed capacity and the production was even less as compared to the targets.

Referring to loss incurred by the company in transit of lead and zinc concentrates from mines to smelters as well as in inter-smelters transfers, the CAG said the percentage of losses differed widely in different years and in different units. The total loss in transit during the five years ending 1990-91 was more than Rs. 350 lakh, the report said.

EIGHTH PLAN ALLOCATIONS:

Rs. 14,000 crore outlay for steel sector

The Planning Commission has slashed the Eighth Five Year Plan outlay for the Steel Ministry. The plan outlay for the steel sector has been pegged at Rs. 14,000 crore against Rs. 24,000 crore projected by the Ministry.

The cabinet has already approved the plan outlay prepared by the Planning Commission. The sharp cut comes as a setback for the Steel Ministry in view of massive modernisation programmes undertaken by various public sector undertakings under its administrative control during the plan period.

No outlay for IISCO modernisation

The Planning Commission officials said that plan outlay for the Steel Authority of India Ltd. (SAIL), has been kept at Rs. 12,500 crore as against Rs. 19,300 crore proposed by the Ministry.

SAIL officials expressed disappointment over the sharp reduction in their plan outlay. SAIL had, in its proposal, included the modernisation of Indian Iron and Steel Company Ltd., (IISCO) to be carried out in the Eighth Five Year Plan period.

Officials in the Planning Commission explained that since the Ministry was considering modernisation of IISCO through private sector participation, there was no justification of including an expenditure of Rs. 6,500 crore in the plan outlay of SAIL

It may be recalled that SAIL has prepared a Rs. 6,500 crore modernisation programme for IISCO. The Public Investment Board (PIB) has given conditional clearance to the Steel Ministry that it should first explore private sector participation for the modernisation of IISCO.

In the event of no company in the private sector coming forward, it may approach the cabinet for going ahead with the modernisation to be taken by the SAIL.

A senior official of SAIL said that reduced plan outlay would strain the company's various modernisation plans to be undertaken during the plan period. The second phase of Rourkela Steel Plant's (RSP) modernisation is to cost Rs. 4,000 crore. Similarly, the modernisation proposal of Bhilai Steel Plant (BSP) comes up before PIB next month. BSP modernisation is expected to cost Rs. 2,500 crore.

The modernisation programme of Bokaro Steel Plant is also overdue. SAIL officials said that this would also be taken up during the Eighth Plan and would cost Rs. 3,000 crore. The cost of Durgapur Steel Plant's modernisation, which is underway, is expected to be around Rs. 2,000 crore. This leaves hardly any scope for additions, modifications and replacement of equipments and machinery for which SAIL had sought an outlay of Rs. 2,000 crore.

SAIL officials, however, exuded confidence that the company's internal generation would be over 25 per cent more than what has been accepted by the Planning Commission. SAIL is expected to raise the prices of steel in the next few days which is expected to substantially improve its profitability.

They said that it would be able to meet their planned expenditure. The officials refused to comment as to what would be the position if they were forced to implement the IISCO modernisation.

The Planning Commission has been quite generous to Rashtriya Ispat Nigam Ltd. (RINL). RINL, which runs Vishakapatnam Steel Plant, has been allocated Rs. 950 crore as against Rs. 1,025 crore sought by the Ministry. National Mineral Development Corporation is also hit by cut in its plan outlay.

It has been allocated Rs. 600 crore as against Rs. 1,050 crore sought by the Ministry. Cut in plan allocation is likely to affect its efforts to develop mines during the Eighth Plan period.

HIRA FERRO ALLOYS PLANS EXPANSION

Hira Ferro Alloys Ltd., which is currently manufacturing 8,000 tonnes of ferro manganese alloys per annum, is planning expansion of another 10,000 tonnes per annum. Hira Alloys has been winning accolades from Bhilai Steel Plant. The proximity of the unit to raw material sources and the ferro alloys market, has enabled the company to think in terms of expansion.

The existing units of 8,000 tonnes and 5,000 tonnes in Raipur manufacturing ferro manganese alloys will be augmented by a physically adjacent unit of 10,000 tonnes per annum consisting of two 2.5 MVA furnaces. The current year's turnover of the company was 11.20 crores.

The gross profit was 1.2 crores and the net profit was Rs. 80 lakhs. The earning per share works out of Rs. 7 for the current year.

The other group companies are Jain Carbides and Chemicals Pvt. Ltd., Hira Industries Ltd., Hira Cement Ltd., and Hira Tyres Ltd. **Mr. J.P. Agarwal** is the Chairman of the group. The group is soon planning to enter into new activities like manufacture of phosphorus.

It has also plan for 10 mw captive power station. Hira Alloys has approached the Industrial Development Bank of India (IDBI) for a term loan for the expansion of project and a rights issue of approximately Rs. 3.5 crores is on the anvil.

Efforts on ocean mining below targets

The Department of Ocean Development (DOD) has made little headway in its ambitious programme to tap trillions of tonnes of metals entrapped as nodules in the ocean bed. Most of the targets of the Seventh Plan for ocean development have not been realised, says the report of the Comptroller and Auditor General (CAG), citing lack of effective monitoring and virtually no progress in key projects as the reasons.

DOD's polymetallic nodule (PMN) programme aims at identifying, recovering and analysing polymetallic nodule deposits lying 3,500 to 6,000 metre deep in the central Indian Ocean. The deposits contain about 30 metals, including nickel, copper, cobalt, manganese, molybdenum, vanadium and titanium.

The report, recently tabled in the Parliament, says against 1,200 shipdays projected for survey and exploration during the Seventh Plan, DOD used only 638 shipdays. The collection of nodules too was below target. Little or no headway has been made in developing a sea bed mining system, while work on identifying mine sites and on test mining need to speeded up.

No studies have been initiated on disposal of toxic wastes and only limited information is available on the quality and types of sediments associated with nodules. The CAG pulled up the DOD for releasing funds in excess of immediate requirements, noting that implementation of programmes has not improved by over funding them.

The working groups set up to check the progress of projects rarely met and the polymetallic nodules programme was not monitored effectively for two years from May 1987 to October 1989. The report has a dig at the Department for the lack of "realistic planning and implementation and correlated funding". It had originally aimed to collect 40 tonnes of bulk samples every year by dredging, without developing the necessary extraction technology, and finally collected only 51 tonnes from 1981 to 1989

The first stage of activities for extracting metals had been delayed by more than three years and work till March last year proved to be substandard, generating information that could not be used further. The experiments conducted were on smaller scale and not under standard conditions required to standardise the process.

HINDALCO INDUSTRIES' GROWTH IMPRESSIVE

The performance of Hindalco Industries during the year ended March 1992, registered an impressive growth and all past performance records were surpassed. The directors have stepped up the dividend to 37.5 per cent from 30 per cent paid last year, absorbing Rs. 14.54 crores.

Hindalco also surpassed its previous sales performance record both in terms of quantum and value. The sales turnover during the year was Rs. 855.87 crores (inclusive of excise duty) against Rs. 671.63 crores in the previous year.

The company has earned a profit of Rs. 88.04 crores during the year against Rs. 64.82 crores last year, after providing for depreciation (Rs. 21.06 crores against Rs. 16.44 crores) and taxation of Rs. 62 crores against Rs. 33.60 crores.

During the year, the exports were Rs. 23.98 crores against Rs. 12.10 crores. This is a major achievement considering the depressed international prices. The company is planning to export a higher quantum during the current year.

The modernisation schemes implemented in the recent past have helped the company to achieve levels of production higher than its rated capacity. Looking at the expected growth of demand of aluminium metal, the company plans to increase the production progressively in stages. In the first stage production will be increased by 12,000 tonnes per annum.

Further more, an additional capacity of 50,000 tonnes per annum will be installed to increase production in two phases of 25,000 tonnes each. Thus production will increase by a total of 62,000 tonnes. In the first phase, capacity of the alumina plant is being increased from three lakh tonnes per annum to 3.50 lakh tonnes by installing balancing equipments.

The company is also taking steps to increase the capacity beyond 3.50 tonnes per annum. Lurgi GmbH of Germany have conducted a study of the company's alumina plant and have made recommendations for expansion together with steps to reduce the consumption of stream, energy and other inputs in the existing plant.

The work on setting up the new cold rolling mills is progressing satisfactorily. The mill which is expected to be commissioned by March 1993, will enable the company to produce products, of very high quality for sophisticated applications.

S.N. MALIK IS NEW MMTC CHIEF

Mr. S.N. Malik has taken over as Chairman and Managing Director of the Public Sector Minerals and Metals Trading Corporation (MMTC).

Mr. Malik, who has been appointed for a period of five years, took over from **I.G. Jhingran,** Additional Secretary, Ministry of Commerce, who was holding charge as chief of the organisation after **Mr. S.K. Agarwal,** left MMTC on superannuation on March 31, 1992.

Caparo takeover of IISCO ruled out

Mr. Swraj Paul, the NRI industrialist and chairman of the London-based Caparo group, has ruled out taking over the Indian Iron and Steel Company (IISCO), a Central public sector undertaking, unless he is given a "free hand" both in the import of technology to modernise the plant and its management.

Mr. Paul recently held discussions on the issue with the Steel Ministry, but they were of no avail as the latter insisted Mr. Paul accepting the technology options outlined under the report prepared by M.N. Dastur and Company. "I will get into IISCO provided I am given a free hand bringing in the technology I think is required for the plant", he declared to newspersons at a press briefing in New Delhi on May 15.

According to him, three other firms were presently negotiating with the Steel Ministry for the takeover of IISCO. However, Mr. Paul did give an indication of his continuing interest in the bid when he remarked that if the Steel Ministry still felt otherwise he would be "happy to look into it".

Mr. Paul, however, was happy at the progress on the proposed three million tonnes per annum plant near Cuttack in Orissa — a joint venture with the Orissa government — to be set up in three phases. The first phase of the project would be worth Rs. 4,000 crore, about a third of it in foreign exchange, of which his group will have an equity of Rs. 200 crore and the Orissa government Rs. 100 crore.

It will produce both hot rolled and steel rolled coils, with the Indian consultants for the project being Metallurgical and Engineering Consultants (India) Ltd. (MECON) and the British consultants being British Steel Consultants. The preliminary project report would be presented shortly and and by October his company would go to the capital market for finances, he stated.

ORISSA SET FOR A THIRD STEEL PLANT

Orissa is set for a third steel mill, a Rs. 1,000 crore pig iron plant to be set up by a consortium of companies including the Steel Authority of India Ltd. (SAIL), near Duburi in Cuttack district close to the site where the proposed joint sector Kalinga Steel Plant is to be located, according to official sources.

The one million tonne capacity pig iron plant, to be converted into a fully integrated steel plant in due course, was at an advanced stage of planning, the sources said. According to the Minister of State for Planning and Coordination, **Mr. Prafulla Chandra Gharai,** the foundation of the project was expected to be laid by October next.

Besides SAIL, the other companies involved in the project are the central sector Minerals and Metals Trading Corporation, private sector Orissa Sponge Iron Ltd., the state-owned Orissa Mining Corporation, Industrial Development Corporation of Orissa Limited, Industrial Promotion and Investment Corporation of Orissa Ltd., and an Australian industrial group, the sources said.

The sources said that the SAIL would contribute Rs. 90 crore for the pig iron project, while the other companies in the consortium would raise Rs. 217 crore while the Industrial Development Bank of India (IDBI) had also been moved for financial assistance. The project was being built on the same spot earmarked for setting up of the second steel plant by the Neelachal Ispat Nigam, floated by the Government of India in the early eighties.

In fact, the State Government had moved the Centre for taking over the Nilachalpat Nigam, a registered company, with its assets and liabilities for developing the pig iron project. The Chief Minister, **Mr. Biju Patnaik** had held several rounds of discussions with the Union Government in this regard.

The government had also issued the notification for acquiring 3,000 acres of land at Duburi for the purpose, while the Centre had been moved for environment and forest clearance, the sources said.

The plant would employ the blast furnace route to produce molten iron which would be blended with sponge iron to manufacture billets. It had also been decided to purchase a second hand blast furnace from Mexico and a coke oven plant from Russia for the plant, the sources said. The target was to commission the plant by the end of 1994.

MECON SIGNS MoU WITH STEEL MINISTRY

The Metallurgical and Engineering Consultants' (India) Limited (MECON) signed a memorandum of understanding (MoU) with the Union Ministry for Steel for the current financial year (1992-93) on May 6. MECON sources said at Ranchi that the Chairman-cum-Managing Director of MECON, **Dr. S.K. Gupta,** and the Secretary, Ministry of Steel, **Mr. P. Vasudevan,** signed the MoU.

The MoU aimed at a profit target of Rs. 9 crore and a turnover of Rs. 120 crore envisaging a target of Rs. 105 crore for procurement of orders in consultancy as well as equipment supply areas, the sources said.

The MoU also stressed upon research and development (R & D) activities. MECON had also recently introduced a performance-linked incentive and reward scheme for its employees to ensure the fulfilment of financial performance as indicated in the MoU, the sources added.

Highlights in Chemical Technology

MINIATURE TV ANTENNAE LIKELY IN THE NEAR FUTURE

A television antenna slightly broader than a matchbox (two inches by two inches) can replace the large ones now in use when they are made of high temperature superconducting material soon to be realised. Work on it is on at the Tata Institute of Fundamental Research (TIFR) at Bombay and two national laboratories.

The only condition is that the miniature antenna is to be kept in liquid nitrogen to keep the temperature down (below liquid nitrogen's 77° K, zero° Kelvin being equal to minus 273°C, and the room temperature 300 K). Liquid nitrogen is easily available in the country, according to Prof. R. Vijayaraghavan, head of Solid State Physics at TIFR. Liquid nitrogen's best application would be in space ships in which the temperatures would be below 77 K to protect devices used for research as also for launching the ships, as the devices would be small, reducing the ship's weight. Its use in fast computers is also possible.

Superconducting microstrip resonators using thin film technology in the C-band microwave frequencies (4-8 Gegahertz — Gega is one kilo million hertz) have been realised for the first time in the country at TIFR. They have microwave applications like in filters and noise reduction transmission including applications to improve the TV picture and reception, with improvement of 50 to 100 times in what the engineers call signal-to-noise ratio.

Dr. R.S. Chaughule, of TIFR, one of the organisers of the symposium, giving a gist of discussions at a recent national seminar on "Current status and future directions in condensed matter physics" at the Poona University Campus, held under the joint auspices of TIFR and Department of Physics of the University, said that the superconductivity magnet, would be so powerful that it could draw out a lot of impurities from the iron ore.

Thin film technology, which will enable manufacture of the mini-antenna, is one of the applications of high temperature superconductivity. A panel discussion by scientists specialising in fields such as thin film technology, bulk materials and SQUIDS (Superconducting Quantum Interface Devices) meant for medical, geological and other applications was held as part of the symposium when recent advances in the theoretical understanding of high temperature superconductivity and the recently-observed superconductivity in 6_{60} (C for carbon) molecules were noted.

The SQUIDS, said Dr. Chaughule, were extremely sensitive devices which measured minute changes of magnetic flux, and were finding applications in recording magneto-cardiogram and brain waves. These were also used as magnetometers for studying magnetic properties of very weak magnetic materials.

Dr. V.K. Mishra, joint adviser to the Department of Science and Technology, who was in the panel headed by Dr. R.M. Iyer of the Bhabha Atomic Research Centre (BARC), got to know the latest in the applications of high temperature superconductivity. He is the coordinator between the Planning Commission and the newly-constituted Science and Technology Board, which has replaced the apex body that looked after research, after the death of the former Prime Minister, Mr. Rajiv Gandhi.

The symposium will enable the Planning Commission to decide on the areas to which the money for research should be diverted, he told the symposium. The areas of research and new emerging research facilities prominently discussed included the Synchrotron Radiation facility at Indore, the new Dhruva Reactor at the BARC, Bombay; setting up low temperature facilities and helium liquefiers, lasers, their present and potential applications, magnetism of new class materials such as heavy fermion systems — alloys in which the electrons go missing and could not be counted and oxide superconductors. NMR, it was pointed out, was one of the important tools of condensed matter physics. Apart from studying magnetic property of materials, it is used as magnetic resonance imaging device to detect diseases of the brain. Material characterisation techniques such as Transmission Electron Miscroscopy (TEM), another powerful tool to study materials at atomic levels, were discussed. The TIFR using TEM is helping a Chiplun-based firm manufacturing oxides and electrodes with analysis of its materials.

Also discussed were amorphous systems and liquid crystals, a field in which the 1991 Nobel Prize was awarded to Prof de Genes. Heavy fermion superconductors and high-T (transition chamber) oxide superconductors have been the focus of extensive investigations for many years, from the viewpoint of unconventional superconductivity. A common feature of these two exotic classes of superconducting materials, is that their normal state magnetic properties are intimately connected with their superconducting behaviour. In high T_3 materials, superconductivity is observed from around 20 K to 125 K though the nature of superconductivity is not yet clearly understood. With the discovery of superconductivity in materials based on C_{60} (another form of carbon besides graphite and diamond), the stage is set to witness an exciting phase of research in superconductivity and magnetism. Various theories of high-T_c layered superconductors were discussed. Electronic magnetism

shows a wide variety of magnetic phenomena in the temperature range from as high as 1000K to as low as 0.010K in different materials. However, nuclear spin ordering is expected only in the 0.000001K region since the nuclear moments are only one thousand of those electronic moments.

Fortunately, there exist rare earth alloys such as $PrNi_5$, $PrCu_6$ (Presedonium niborium) whose nuclear moments are enhanced through magnetic hyperfine interactions, according to Dr. Chaughule. Studies of the nuclear spins ordering will help scientists to understand the various models of magnetism since there is virtually no direct contribution from electronic spins and phonons at these temperatures. The Pr nuclear spins underwent nuclear ferromagnetic ordering below 0.00040K and efforts were being made to see the first nuclear spin glass below 0.00010K, he said. The new Dhruva Reactor at BARC is an advanced research reactor to carry out studies in the frontier areas of nuclear science and technology. Dhruva uses metallic natural uranium as fuel and heavy water as moderator. This reactor is capable of giving a maximum neutron flux of 1.8×10^{14} n/cm²/s which makes it one of the high flux research reactors in the world.(*Times of India*, Nov. 10)

TELE-WARS

The replacement of all existing television sets by ones with a totally different design capable of reproducing a higher picture quality is a weighty technological and commercial challenge facing developers of high definition television (HDTV). With the battle between European developers and those in Japan reaching fever pitch, the European Community has decided to throw all its weight to defend their system. While existing television sets in most parts of the world use the so called 4/3 format, the European HDTV will feature a much broader screen known as 16/9, and will be based on what is known as an HD-MAC (analogue multiplexing by computers) standard, which allows sound, light and colour to be coded separately. Apart from avoiding parasitic mixing of signals, the advantage of the MAC standard is that it will allow sound to be broadcast in different languages simultaneously.

At the same time, several European companies have involved themselves in a US project to develop digital television. Still in the drawing board stage, European developers hope to integrate several features of digital television in their HDTV project. (*The Economic Times*, 26 Oct 1991).

SOUND PRACTICE

Imagine standing in the centre of a room, surrounded by four people, each at different points of the compass and all of them speaking simultaneously. No matter in which direction you turn, the voices will always come from the same fixed points around the room. Now, an innovative new technology called, Virtual Acoustics, being developed by scientists at NASA, the University of Wisconsin and a private company called Crystal River Engineering, aims at reproducing that effect in a pair of head phones, using just four radio channels and some very clever electronics. To do this researchers are working out a set of "impulse responses" that capture the effect of noise filtering by the outer parts of the ear, the head, shoulders and torso of a human. The responses are then fed into a fast signal processor known as a convolvotron, which uses the data to utter sounds so that they appear to be coming from different sources. Headphones equipped with a magnetic tracker, allow the convolvotron to keep sounds in the same place as the listeners head moves. Air Traffic Controllers and pilots are just two kinds of users who have already been identified as possible users of the new technology, which could turn out to be the voice of the future. (*The Economic Times*, 26 Oct. 91).

CASE FOR RE-EXAMINING INDIAN SCIENCE HISTORY

A case for re-examining the science history of India was made out by participants at an international symposium organised by the Birla Science Centre, Hyderabad, recently on Asian Astronomies and Science. Studies by Prof. B.G. Siddharth, Director of the Birla Planetorium, point to a long astronomical tradition in the Rig Veda which inturn indicates that the Rig Veda must have been written before 900 BC. According to conventional wisdom, the Rig Veda was composed around 1300 BC though some scholars placed the date around 400 BC. It was also pointed out that research work on unravelling enigmas and interpreting contents of Vedic literature could yield a wealth of useful material.

The Birla Institute of Scientific Research in Hyderabad has prepared some unknown alloys, a new type of glass and a variety of porcelain following writings in ancient texts like **Vimana Shastra, Anju Bodhini, Krutaka Vajra, Nirnaya, and Jalatatva Prakarma.**

In preparing these materials, the BISR team headed by Dr. M.C. Ganorkar followed procedures and quantities of materials described in Vedic texts and physical properties of materials which were thus prepared, like colour, softness, density and hardness, were to a large extent the same as those reported in the Sanskrit texts.

Tamogarbha loha, a lead alloy capable of absorbing light, has been found to be resistant to acids and is being tested for optical properties.

Pancha loha, a copper alloy with zinc and lead has been found to resist corrosion by salt water. This alloy which was tested at Mishra Dhatu Nigam Midhani, a central government undertaking specialising in alloys, was

found to have high machinability and on micro structure analysis was found to be a single phase alloy with malleability.

Araara tamra, a rare alloy of copper, zinc, lead and iron was found to be resistant to corrosion by salt water. On microstructure analysis, it was found to be a two-phase alloy.

Chapala grahaka was a fine porcelain type of ceramic, resistant to acids and alkalis. A soft glass of low temperature melt resistant to acids and alkalis, called chapala graphaka, was also prepared.

Besides, the BISR team has fully deciphered details about several other materials like alloys and glasses. These materials are yet to be prepared in the laboratory. They also deciphered a formula for protein rich food extract from common Indian grasses and the CFTRI was being involved in a joint project to prepare cheap food products based on grass. Dr. Ms. Satyavati of ICMR observed that Charaka had mentioned psychosomatic approach, a concept which evolved in modern medicine only in the present century. Her work on a quote from **Sutrasthana in Susruta Samhita,** which seemed to describe pathogenesis of atherosclerosis, led to refining of an ayurvedic medicine for cardiac disorders from guggul which was earlier used as base for an anti-arthritic drug. Charaka had also described conversion of carbohydrates into fats, anticipating modern science. (*TOINS*, Dec. 20, 1991).

BUOYANCY KEY TO NEW PROCESSING METHOD

Japanese researchers have invented a method for using high-pressure gas to levitate materials during heat treatment so as to avoid contamination from the walls of the vessel. This new twist on containerless processing is more widely applicable than earlier ground-based levitation methods, they claim, and it's cheaper than space-based processing. Furthermore, it can be done in conventional industrial equipment, which may help speed it to market.

Levitating materials during processing is the best way known to ensure their purity. High-purity materials which are in great demand in electronics, optics and other areas, usually are produced by a melting process. Unfortunately, containers used to hold the materials also tend to contaminate them. And heterogenous nucleation occurs at the container walls when molten materials are cooled. Levitation avoids these problems, because the material being processed is not in contact with the container.

Levitation has been successfully used in materials processing experiments in space (aboard the space shuttle, for instance) and under free-fall conditions in drop tubes or aircraft. Such experiments are very expensive, however, to bring the benefits of levitation down to Earth, Scientists have developed ways to use electromagnetic, electrostatic, aerodynamic and acoustic forces to suspend materials. Some of these methods have already been commercialized for special uses, but none are generally applicable, says Kozo Ishizaki, a materials scientist at Nagaoka University of Technology, Electromagnetic levitation, for instance, requires that the sample be electrically conductive.

Because the new levitation method is based on buoyancy, the density of the material is the only limiting factor, says Ishizaki, who invented the method with Makoto Nanko. The material to be levitated is placed inside a cylindrical chamber that is then pressurized with a gas such as argon. Under a pressure of 100 atm. for example, argon has about the same density as water, so a material that floats in water will float in the densified gas. Denser materials require denser gases. By choosing the appropriate gas and pressurizaation, most

materials of interest can be levitated and heated. Ishizaki's method is not limited to noble gases or pure gases. A key point is that the levitation and processing can be performed using equipment designed for hot isotatic pressing (HIP). Such equipment is commonly used in the advanced materials industry.

This method can be used for the production of 'perfect spheres' of polyethylene in conventional HIP equipment. Such spheres are used, for example, as calibration standards in electron microscopy. The method could be used to produce perfectly spherical lenses from high-purity glasses. (*C & EN*, Jan 6, 1992).

CONDUCTIVE POLYMER COATING PROTECTS STEEL FROM CORROSION

An electrically conductive coating that protects steel from corroding even in severe environment has been developed by researchers at Los Alamos National Laboratory and the Kennedy Space Center. "The conducting polymer coating acts as an active electronic barrier to corrosions", according to Debra Wroblcksi of Los Alamos' materials technology: polymers and coatings group. It is thought to restrict the transfer of electrons from the steel's iron to the oxidizing environment. The coating consists of two layers. First is an undercoat of polyaniline, a conducting polymer, applied directly onto the steel. This is followed by a durable top coat such as epoxy. Developed to protect launch pads from corrosive exhaust during space shuttle launchings, the coating has potential applications wherever steel is exposed to corrosive elements, such as moisture and salt. (*C & EN*., Jan 20, 1992).

TRANSPARENT COMPOSITE CONDUCTS ELECTRICITY

A composite sheet material that is optically transparent and electrically conductive through the thickness of the sheet has been created by researchers at AT & T Bell Laboratories (*Science*, 255:446 (1992). The material's properties make it potentially useful for a variety of device applications such as write pads, touch-sensitive screens, sensors and alarm devices. Sungho Jin & coworkers make the composite by thoroughly mixing a transparent uncured silicone elastomer with silver — or gold-coated 20μm nickel spheres. The viscous mixture is spread on a flat glass substrate and formed into a layer about 150μm thick. This is then heat-cured in the presence of a unidirectional magnetic field. The field causes the ferromagnetic spheres to position themselves into parallel, vertically arranged columns (chains of spheres), most of which extend through the entire thickness of the layer. The cured sheet containing the locked in nickel "filaments" is then peeled off the substrate. By coating the top surface of the composite material with a very thin layer (about 5μm) of insulating silicone elastomer, the researchers can turn on electrical conduction by applying a certain threshold pressure. The pressure exerted by writing on the surface with a stylus, for instance, causes conduction; the surface of the write pad remains non-conducting when just a hand rests on it. (*C & EN*, Jan 27, 1992).

OIL SLICK CONTROL PROCESS TO UNDERGO FURTHER TESTS

A new technique for containing and breaking down ocean oil spills is being readied for larger scale testing following successful small-scale tests during the past year. According to developer, Lockheed Missiles and Space Co., although the concept of using oil-eating micro-organisms is not new, the process of applying a product consisting of clay, fertilizer and microbes to contain and breakdown an oil slick hasn't been explored. The process involves application of a powdered clay, called Petro-Lock, to the slick to coagulate the oil

and prevent it from sinking. The micro-organism tradenamed Marine-D, is applied with a nirogen-based fertilizer to begin digesting the oil. The micro-organisms secrete a fatty acid that can be eaten by plankton. "Our current plan is to disperse the materials dry by airplane or ship using pneumatic pressure", says project manager Tom Worthington. New tests using a special 500,000-gal. ocean wave simulation tank at Lockheed are being planned. (*C & EN*, Jan 20, 1992).

ACETALDEHYDE PROCESS CUTS TOXIC BY-PRODUCTS

A new catalytic technology for making acetaldehyde that eliminates chlorinated organic byproducts has been developed by Catalytica, Mountain View, California. The catalyst system can be used in existing two-stage wacker-type acetaldehyde plants with little or no modification to existing hardware, according to Catalytica researcher, John H. Grate. It has been tested successfully on a commercial scale. Like the conventional Wacker system, the new approach uses a palladium catalyst to oxidize ethylene to acetaldehyde. But instead of using the copper chloride co-catalyst of the conventional system — which, is what produces the toxic chlorinated organics —the new system uses phosphomolybdovandate polyoxoanions. Catalytica says its technology is also applicable to oxidation of higher olefins to ketones —for example, oxidation of linear butenes to methyl ethyl ketone. Such operations must now be accomplished by more complex indirect routes. (*C & EN*, Jan 27, 1992)

OCTANE CHECK

Present evaluation methods for achieving the right octane level in gasoline leave much to be desired. A key to engine performance, inaccuracy has proved costly for refiners as they prefer to err on the side of caution by adding more octane than really needed. They measure octane levels in finished fuels by determining how much a special test engine 'knocks' during combustion. Now a petroleum company has developed a new procedure that adjusts octane during blending — it studies gasoline under near-infrared light. Different molecules absorb light at specific frequencies and by measuring the amount of absorbed light, refiners can evaluate octane levels and adjust them to reach the proper mix.

The system is expected to save $1 million a year by setting octane levels more acuratcly and in keeping with regulations. (*The Economic Times*, May 9, 1992).

PROTEIN SOLUTION

The clamour for an end to non-biodegradable waste is rising, and makers of detergents and paints find themselves high on the hit list. A key ingredient in many household items is polyacrylic acid — a major contributor to the growing tonnes of non-biodegradable waste. Building on the research of two professors from the US, a chemical company has patented a process to make large quantities of polyaspartic acid —an alternative to polyacrylic acid which is biodegradable but costs twice as much.

This acid is a protein derived from the same family that forms sea shells and can be broken down by bacteria in water treatment plants. The process involves heating aspartic acid to around 400°F. This causes the chemical to polymerize and form long chains. The chains are then added to a chemical base, triggering a reaction to create polyaspartic acid.

The company hopes the environmental benefits of this new find will be enough to make producers make the more expensive switch. (*The Economics* Times, May 9, 1992).

SILICON-BASED CERAMICS CAN BE PRODUCED AT LOW TEMPERATURES

German researchers have developed a low-temperature method to make dense silicon-based ceramics. The new process avoids the problems common in conventional syntheses caused by using sintering aids that can be used to make ceramic components and matrix composites at relatively low temperatures (below 1000°C).

Conventional preparation of advanced ceramic parts based on silicon carbide or nitride involves pressureless sintering, hot pressing or hot isotatic pressing of the appropriate ceramic starting powders.

High sintering temperatures in the range of 1500-2200°C and other aids are used to enhance the densification of the ceramics but these can impair the physical properties of the product. Researchers at the University of Stuttgart & the Max Plack Institute for Metallforschung report in a recent issue of *Nature* (Vol. 355, no. 6362) a method that saves on these high energy costs while achieving the direct transformation of metallo-organic precursors into non-oxide silicon-based ceramics with relative densities of upto 93%.

The first step involves the synthesis of infusable polymethylsilazane by heat-treating commercially available polysilazone at 350°C for 100 minutes in an argon gas atmosphere and then distilling volatiles in vacuum for a further 80 minutes. The resulting polymeric product is then crushed and bail milled and isostatically pressed to form green compact.

The final step involves pyrolysis of the compact in a quartz tube under argon or ammonia at 1000°C. The resulting ceramic parts are said to be x-ray amorphous and crack-free, to have relative densities upto 9.3%, to have good weak-resistance and not to be scratched by steel. (*ECN*, March 2, 1992).

COLLOIDAL SUSPENSIONS OF SILICON LUMINESCE

Electrochemically etched silicon wafers that emit visible light when illuminated or zapped with electricity have created a tizzy in the materials world over the past year.

They could well be the harbinger of the optical computer. Now chemists at the University of California, San Diego, in La Jolla, have found a way to convert such porous silicon wafers into colloidal suspensions that luminesce (*Science*., 255:66 (1992).

The wafers can be ultrasonically dispersed into a variety of solvents to give a suspension of fine silicon particles. Adding polystyrene to a toluene suspension of silicon and casting the resulting solution onto a glass slide leads to the formation of luminescent composite films.

The work was done by assistant professors M.J. Sailor of the Chemistry Department and Karen L. Kavanagh of the electrical and compuer engineering department, and their co-workers. "In contrast to the gas-phase preparations of colloidal silicon", they note, "this technique produces silicon particles from high purity semiconductor-grade substrates, resulting in a more convenient synthesis that avoids contamination by SiO2 and other impurities".

The new preparative method also allows easier processing of the luminescent silicon into other forms, Kavanagh says. Studying the colloidal silicon particles may also shed light on the mechanism of their light emission, she addes. (*C & EN*, Jan 6, 1992).

Science Briefs

INDIA'S FIRST GRID INTERFACED SOLAR PV SYSTEM

The country's first grid interfaced five-kiloWatt solar photovoltaic system has been installed by the Engineering Staff College of India (ESCI), Hyderabad. The five kW solar photo voltaic (PV) project has two components. The first is the design and development of a 4.72 kW fixed tilted array, the output of which is pumped into the utility grid of the Andhra Pradesh State Electricity Board (APSEB). The second is the design of a 744 W single axis tracking PV array, the output of which is connected to a storage battery tank. The system installed by the ESCI researchers has so far supplied over 5000 kW hours to the APSEB grid. Power is also being used for lighting in the Institution of Engineers building.

The photo voltaic modules were manufactured by the Bharat Heavy Electricals Limited (BHEL), CEL and Solarex and supplied by the Department of Non-Conventional Energy Sources (DNES), which funded the Rs. 1.5-million project. The system supplies an average of 15 units per day to the APSEB grid. The lighting system based on the solar PV saves nearly 80 per cent energy compared to incandescent lamps, and has eight times longer life, high resistance to voltage fluctuations and low operating cost.

Solar photo voltaic projects are slowly catching up in India in the form of street lighting, community lighting, television systems, and water pumps in villages. The PV system at ESCI is part of the energy-eco plaza being undertaken by the ESCI in which a variety of non-conventional sources of energy would be demonstrated as environment-friendly and high energy-netting system.

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SEA-LEVEL RISE AROUND COASTAL INDIA BY 2030

The sea-level is likely to rise along the coasts of West Bengal, Andhra Pradesh, and Kerala, and temperatures will rise across the country 40 years from now, according to a computer-generated scenario of India.

Scientists at the Indian Institute of Technology in New Delhi drew this scenario in a study of the impact of global greenhouse warming on India in 2030 AD when carbon dioxide levels are likely to double present-day levels.

Temperatures will go up during both summer and winter. The increase will range from a low one degree celsius in summer to a peak 3.4 degrees celsius in winter. The highest increase will occur in the northern parts of India. The scientists working at IIT's Centre for Atmospheric Sciences have calculated that the annual mean sea level rise will be 20 cm along the coast of West Bengal, 10 cm along Andhra Pradesh, and about 5 cm along Kerala.

"Low-lying regions on the east coast could suffer from more erosion, salt intrusion, and greater risk of flooding, the scientists M. Lal and B. Bhaskaran said reporting their findings in a journal of the *Indian Academy of Sciences*. They said no significant change in the sea level is expected over much of the Maharashtra and Gujarat coastline.

The model also indicates changes in rainfall as a consequence of the greenhouse warming. Rainfall will be enhanced over northeast India and the southern peninsula during summer, the scientists said.

However, a decrease in monsoon rainfall is expected over the central plains of India covering parts of Bihar and eastern Uttar Pradesh, both of which are major agricultural zones.

FUELS FROM DISTILLERY EFFLUENTS

Researchers have developed a process to extract fuels from common distillery effluents that are a major environmental hazard, giving foul smell and helping breed numerous insects. A new method devised by the University Department of Chemical Technology (UDCT), Bombay, offers a simpler and cheaper way to dispose distillery effluents, get fuel and prevent oxygen depletion in rivers and other water sources that serve as a sink for the wastes.

Current techniques of incineration, anaerobic treatment and wet-air oxidation, widely employed in various industries, do not solve pollution problems or save energy. The UDCT team of researchers focussed attention on sillage, the effluent that is 12 to 15 times the volume of alcohol produced from molasses, by-product of cane sugar manufacturing factories. Sillage contains cellulose, hemicellulose and lignin in high amounts which can serve as vital fuel components.

The researchers converted the distillery effluent into solid and liquid reidues by simply heating it to 250 degrees celsius in the presence of a catalyst. The solid residues have properties similar to coal and can, therefore, be used as a fuel. The liquid fraction has been found to be similar middle distillates — kerosene and furnace oil — from petroleum refineries. An added attraction of the process is the energy recovered —about three tonnes of steam every hour. This is sufficient to run the distillery and waste treatment plants, outweighing all investment costs, UDCT scientists report.

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The study based on a climate community model of the American national centre for atmospheric research also indicates that the central plains of India could be relatively dry during summer in a warmer atmosphere.

The carbon dioxide-induced warming will be less pronounced in the coastal regions of the country, but significant in the warmer continental zones of north India, the scientists said.

They said studies are now underway to come up with more accurate projections of warming over the Indian subcontinent, and the associated changes in wind, rainfall, and soil moisture.

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NEW TOMATO HYBRIDS FROM IARI

Two new tomato hybrids that give higher yield and are easier to transport have been developed by scientists at the vegetable crops division of the Indian Agricultural Research Institute (IARI), New Delhi.

The first, "Pusa Hybrid 1", sets fruit even during hot summers in northern India when day temperatures soar to 40 degrees celsius and night temperature to 28 degrees celsius. Most tomato plants normally set fruit when right temperatures are lower, between 15 and 20 degrees celsius.

"Pusa Hybrid 1" has round fruits with thick skin and less juice, which makes them easier to transport over long distances. Each fruit weighs about 60 grams. It yields an average of 32 tonnes per hectare in north India during summer when other varieties do not set fruit. "Pusa Hybrid 2" has high average yields of upto 55 tonnes per hectare during normal spring and summer seasons, and is resistant to nematode attacks. The fruits, which weigh around 80 grams apiece, are round to flattish, with thick skins, IARI scientists said.

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FLUORIDES AFFECT MALE FERTILITY IN RATS

Excessive intake of fluorides affects male fertility in rats, says a study by zoologists at Gujarat University. Excess fluorides are already known to cause dental and skeletal abnormalities, but little is known on how these ions influence soft tissues, especially reproductive organs.

Fluoride intake reduces spermatogenesis and fertility in male rats, conclude recent studies by zoologists from the University School of Science, at Gujarat University in Ahmedabad. Results of the studies were published in the *Journal of Environmental Biology*.

The team of N. Chinoy, P. Pradeep and E. Sequeira had earlier reported that fluoride ingestion in mice altered the tissue structure and metabolism in testes, affecting spermatogenesis. Their more recent studies, in which sodium fluoride was orally given in concentrations of five and 10 mg per kg body weight to adult male rats for a month, showed that sperm motility and count declined, leading to a "significant decline in fertility by fluoride treatment." However, testicular cholesterol and serum testesterone levels were not affected.

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PROJECTED CARBON DIOXIDE RISE TO BENEFIT CROPS

The projected carbon dioxide increase in the next century may benefit crops, indicate the first Indian studies on the effect of climate changes on plants, initiated at the plant physiology division of the Indian Agricultural Research Institute (IARI), New Delhi.

Studies by a team led by Dr. Y.P. Abrol on wheat, mungbean and mustard indicate that plant biomass may increase by 25-30 per cent at the enhanced carbon dioxide levels anticipated by the turn of the century — about 600 parts per million (PPM). The high gas concentration increased plant biomass, leaf area and plant weight in the three crop plants during trials at the institute.

Wheat also recorded a six-to-eight per cent rise in yield, according to Dr. U.K. Sengupta, another scientist in the study. Although the studies are preliminary, they underscore the need to conduct similar trials in the different ecological zones of India and ultimately determine what new crop strategies need to be adopted in the changed climatic conditions, he said.

During their experiments, the IARI team constructed special "open top chambers" that have four sides covered with polythene and are open at the top. Compared to greenhouses that completely seclude plants from the environment outside, open top chambers allow plants to receive natural sunlight and air.

Each chamber, five feet high and a square metre in area, contained potted plants of wheat, mungbean or mustard. One set of plants received air with the current levels of 350 ppm of carbon dioxide and the other enhanced levels of 600 ppm, through a tube connected to a cylinder containing the gas.

Data on 60 wheat, 60 mungbean and 40 mustard plants show that the plants matured earlier, and had higher biomass and photosynthetic capacity at 600 ppm carbon dioxide. Earlier studies by Sengupta and Aruna Sharma, reported in *Current Science* also showed that the photosynthetic rate and starch content of wheat increased with rise in the gas.

Not all plants are expected to benefit considerably however, only those that use the C-3 photosynthesis cycle, including a majority of cereals, pulses

and oilseeds, many show appreciable changes in biomass and yield. Plants using the C-4 cycle, that include maize, bajra and sugarcane may not show much difference.

The IARI team is trying to enlarge the scope of the trials to include more varieties, larger chambers and additional parameters such as the combined effect of high carbon dioxide and greater temperatures or more ultraviolet radiation. An increase of 1.5 degrees celsius in temperatures every decade and high UV radiation due to an increasing ozone hole are two other climatic changes predicted for the future.

Some crops such as wheat, cowpea and mungbean are extremely sensitive to temperature and length of the day, while others such as maize and sorghum are more resistant. Theoretically, higher temperatures would shift agriculture northward and one can grow more crops in the cold regions which do not support intensive cropping at present, Sengupta said.

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SURGICAL "ADHESIVES"

An adhesive for use in surgical procedures has been developed by researchers at the French National Blood Transfusion Centre, reports CEDUST, a French Embassy newsletter.

The adhesive comes in two separate syringes, just like the ones that come in two tubes in "do-it-yourself" stores. One of them contains the different freeze-dried elements causing human haemostasia (blood-clotting) and the other contains thrombine, that which is the other element used in blood-clotting. Combining the two products causes the formation of fibrinogen. An important fact is that this adhesive, made of human proteins, does not present any compatibility problems.

It can be used in all cases when stitches need to be reinforced, when complete air or water-tightness needs to be ensured, or, more simply, every time bleeding has to be stemmed. Its range of application is vast, with few areas of surgery in which it does not contribute an extra measure of security.

It is part of the equipment used by ear, nose and throat surgeons, plastic surgeons (for skin grafts, in the application of strips of skin, and for invisible scars), bone surgeons (for bonding difficult fractures and attaching tendons), and for treating seriously burned patients. Neuro-surgeons use it, each time they have problems sewing up the meninges, but surgeons of the disgestive tube are the keenest, when it comes to stitching the intestine, or for use in the case of anastomosis in colo-rectal surgery where there is a very high risk of post-operational rupture. The best benefits might be in surgery of the liver, which is rich in tiny blood vessels and in which it is almost impossible to stop bleeding. Whatever care is taken, bleeding is inevitable. Surgical adhesive has removed this great stumbling-block, enabling this kind of surgery to make a tremendous leap forward and become commonplace, while the success of liver transplants increases month by month.

There is thus a huge potential market and annual production amounts to 100 litres. Although it is an expensive product a millilitre costs in France, the equivalent of Rs. 20 to 2,500. An ENT operation needs about 0.5 ml. while at least 5 ml are required for a liver operation. However the demand is expected bring down the price. A new "ready-to-use" adhesive, not requiring any mixing, is also expected to emerge soon, the CEDUST report said.

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TAXOL FROM PINE TREE CHEMICAL

In the key to their progress toward synthesizing the drug taxol in the laboratory, Stanford University chemists have found a starting material not quite "as cheap as dirt," but almost as inexpensive "as potting soil." Taxol is a promising anti-cancer drug that so far can be obtained only through extraction of the bark of the slow-growing Pacific yew tree, Texus brevifolia. The drug has shown remarkable promise in clinical trials as a treatment for ovarian and breast cancer, but it is in short supply.

Prof. Paul Wender reported that by building on pinene, a molecule found in pine trees, his group has developed a shortcut method of making the three-ring taxol core molecule. They are close to completing its final functionalisation — if their work goes according to plan, they expect to achieve a total synthesis by the end of 1992.

Pinene has many attractive attributes as a practical consequence to the fact that the precursor in the synthesis of a material that is difficult to get from one tree is one of the most abundant materials in another tree," Wender said. "You can buy big containers of this; you can buy railroad-car-size quantities of pinene and it is inexpensive."

It is also important that the chemical structure of pinene has the same "handedness" as a taxol molecule, a feature that is crucial to developing a synthetic source of taxol with the same powerful anti-cancer effect. In addition, pinene, a monoterpene, contains 10 of the carbons that are required in the 20-carbon skelton of taxol, a diterpene.

"So, half the solution to taxol we buy", Wender said, "and we need to add to that only the remaining 10 carbons." As a result, their method is probably one of the shortest discovered to date for developing a synthesis of taxol. So far, by building on pinene, the Stanford group has assembled the three rings of the core molecule of taxol and has put together all of the key functional groups on the first generation synthesis

of that tricyclic core this year," Wender said. Current estimates are that hundreds of kilograms of taxol per year will be needed.

Ultimately, however, synthesising taxol will not be sufficient to solve the problems of short supply. "Claiming a synthesis is going to be different from claiming a practical synthesis," Wender said. "And that will be related to the cost of materials and the number of steps required. "That's why we're excited about pinene. It is a starting material that we estimate might cost on the order of pennies per gram."

Wender said the researchers want to know exactly how taxol works to find out whether its anti-cancer properties could be produced by a less complex variation, rather than the whole taxol molecule. The group is optimistic that simpler version of taxol may be equally effective for treating cancer.

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PLASTIC BOLT IS LIGHT, SAFE AND TOUGHER THAN STEEL

A fibre-reinforced plastic bolt stronger than steel but for more friendly to its working environment has been developed by a small Adelaide research company, reports *Australian Science and Technology Newsletter*.

Designed for use as a roof and wall stabiliser in underground tunnels, it also has potential for use in the aerospace industry, because of its lightness and in the chemical industry, due to its corrosion-resistance properties. Its inventor is Applied Research of Australia (AROA), which specialises in research, development and product prototype manufacture and the design of manufacturing equipment.

The Australian mining industry uses about six million steel bolts a year and requires 600,000 dowels, while the plastic product is more expensive to install, it shears off cleanly when struck by coal-cutting equipment, a common occurrence. The plastic bolt quickly pays for itself through reduced machinery damage and absence of coal pollution. Another advantage is that, unlike its steel counterpart, the plastic bolt does not have to be removed from the wall or roof, thus eliminating what can be a dangerous operation.

AROA managing director, Mr. Peter Hastwell, said thaat coal mining in Australia was highly automated. "They use huge machines to cut the coal out," he said. "If the cutter hits the steel bolt a lot of damage results." Despite the use of electromagnets on conveyor systems, steel fragments often got through to create problem in the processing stage.

"One of the problems with our product is the perception that plastic is not as strong as steel," Mr. Hastwell said. "With composite fibre-plastic this is not so. The bolt shank has a tensile strength of 36 tonnes, the thread will take 14 tonnes and we can produce a thread-nut combination up to 20 tonnes." Mr. Hastwell said that shoring up mine walls and roofs accounted for about 40 per cent of the total cost of extracting coal. "Any development that promises long-term savings in this area must be appealing."

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PHOSPHATING PRIMERS FOR NEW AND RUSTED STEEL

A British Company, Luxtrade, is offering a range of phosphating primers for new and rusted steels that are suitable for use on roofs, water tanks, and trailers, reports the journal *Engineering Designer*.

The major feature of the LUX 303 range of phosphating primer is that it is water-based and so there is no danger of fire or explosion during storage, transit, or use, the journal said. It said the primer can also be used in confined interior spaces without fear of the user being overcome by fumes. The product comes in two grades: 303A for heavily rusted steels and 303N for lightly rusted or new steel, galvanised steel, and non-ferrous metals.

Because of the curing system, the product dries to a hard finish even under damp conditions, making it suitable for both internal and external usage. The 303A variant does not require sandblasting prior to use. It is sufficient to remove loose rust particles by wire brushing followed by rinsing with clean water. The report said the product can also be used in lifting gear, safety railings, and walkways and all structural steelwork.

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TWIN MASTER SYSTEM PROTECTS PIPES FROM CALCIUM DEPOSITS

A twin master system designed, manufactured and marketed by a French company, RAUH, prevents scale from building up in bathroom plumbing, water-heaters and pipes, reports ACTIM. Over time, it will loosen scale that has already formed and that is then removed by the simple movement of water.

Scale is a deposit of calcium formed by the passage of water with a high concentration of calcium bicarbonate. Such deposits increase with the water temperature. They can obstruct pipes and calcify plumbing. They are quite harmful: they reduce the productivity of water heating devices and lead to deterioration of taps, faucets, valves, and gates. They also reduce a pipe's cross-section, the ACTIM report said.

Water is treated with an electric field (magnetic or electromagnetic) to prevent scale from forming and without changing the chemical make up of the water. This promotes the creation of free nonadherent calcium crystals that simply flow away with water.

Unlike other systems, the Twin Master system makes use of electric fields and magnetic impulses. The synergy of these processes, each acting on its own, produces results that would be impossible using just on one of these principles. The Twin Master can be installed easily. It does not require any maintenance, and is quite energy-efficient, the report said.

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SOLAR POWER STATIONS IN SPACE

Scientists might have come a little closer to the prospect of building power stations in space that will harness energy from the sun with the development of new photovoltaic cells for use in space. A solar power station will comprise a satellite in geostationary orbit carrying a photovoltaic generator converting light from the sun into energy.

It will also have a system for microwave energy transmission in two parts: the transmission system carried on the satellite with a receiving antenna on the ground to convert the energy received into direct current, and a system to convert this DC power into AC and feed it into electricity grids. Such a system will be capable of exploiting energy from the sun round-the-clock.

One such design of solar power systems envisages the deployment of 60 solar power stations in space, each with a "sent-out" rating on the ground of 5,000 MW. However several problems are yet to be resolved. A major hurdle that will have to be overcome is the transfer of the equipment into a geostationary orbit since the geostationary satellities for capturing solar energy are expected to have a mass ranging between 35,000 tonnes and 50,000 tonnes.

The idea of space-based power station, first conceived in 1968, assumed a system of extremely large dimensions and masses and its installation near the geostationary orbit by teams of astronauts over a long period. According to a report in the journal *French Technology Survey*, scientists are now looking at the possibility of automatic deployment of an experimental space system to test the technical feasibility of production of electricity in a space station.

Experimental investigations will cover the collection of energy and evolution of solar panels in space conditions and the transmission of the energy through either laser or microwaves.

The key components of an experimental power station would be: a main collector — a 50 m parabolic mirror deployable by inflation and rigidifiable in space and a secondary collector — a 9 m cone frustum with solar panels at the focus of the paraboloid. The panels are expected to have an equilibrium temperature of 320 degrees celsius. A set of powerful lasers transmits the energy towards ground in a dry country or on top of a mountain.

A less spectacular aspect, though of still decisive importance, is the development of high efficiency multispectral photovolatic cells. This is one of the major research areas of the CNRS Laboratory for physics of Solids and Solar Energy in France, *French Technology Survey* said. The main approach would be to install photovoltaic panels fitted with concentrators to focus the solar energy on the multi-spectral cells, these panels covering an area of 10 square kilometers in geostationary orbit to produce power ratings of the order of one gigawatt on the ground.

A more conventional approach would be to use silicon photoelectric cells which have the advantage of being well known. However their thickness could not be less than 0.05 mm and there is no certainty that it would be possible to reduce sufficiently their cost. Moreover, their conversion efficiency in thin flat panels cannot exceed 20 per cent, meaning that an area of about 5 square metres would be necessary to generate 1 kW. Photoelectric cells using gallium arsenide can now achieve an efficiency of about 29 per cent in terrestrial conditions with a concentrator and offer much better resistance to cosmic radiation.

However, the cost of the gallium arsenide substrate is five times higher than that of silicon. Hence the importance of the research aimed at reducing the weight and cost of gallium arsenide photocells by using germanium or silicon substrates or the technique of separating the substrate from the active layers of the cell. The most promising approach for improving their efficiency is to minimize the losses from each cell, and to increase the incident power by spectral separation followed by concentration.

This would mean using different materials to convert the different parts of the spectrum separately. The first cell captures the highest energy photons, passing on those of lower energy to the next cell, and so on, in this concept known as multispectral photovoltaic structures.

This technique of stacking up elementary cells can be done mechanically or by monolithic integration. In both cases, it gives an efficiency close to or exceeding 30 per cent. A combination of the two methods suggested by the French Laboratory for Physics of Solids and Solar Energy suggests that much higher efficiencies are possible — 50 per cent in terrestrial conditions.

Gallium arsenide can also be used for the photovoltaic conversion of an incident laser beam with over 50 per cent efficiency which could be a useful technique for transmitting energy through space.

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LIGHT EMITTING FILMS PROMISE NEW DISPLAYS

Scienists at Cambridge University in eastern England have joined forces to develop new polymer films that emit coloured light when stimulated by a small electric current reports *London Press Service*.

This opens up new possibilities for very large multicoloured electronic displays, high resolution portable computer screens and other types of display. It is known that some polymers give out coloured light when a current is passed through them., Now the Cambridge researchers have found a way to vary the colour produced, enabling a pattern to be created in a thin film.

According to physicst Dr. Richard Friend from the University's Cavendish laboratory, it should be possible to use inexpensive polymers to make multicoloured displays that take very little power to function, by manipulating their chemical composition. Together with Dr. Andrew Holmes and Dr. Paul Burn at the Unviersity's chemical laboratory and other colleagues, he has helped develop a process for converting a derivative of a semiconductor known as polypara-phenylene vinylene, or PPV, into a material that glows either yellow-green or red-orange, according to the way it is "tuned". Areas of different colour can be produced within the same polymer film.

PPV is a type of material called a conjugated polymer, in which the carbon atoms are connected via an alternative series of single and double bonds, creating a route along which electrons can travel, and giving unusual properties of fluoresence and electroluminescene. Excited electrtons can move along the chain of conjugated bonds as an electric current, yet they can be made to quickely "relax", or return to their normal energy level, emitting photons of light as they do so. The treated polymer is said to be about 30 times more efficient then ordinary PPV in terms of converting electrical energy to light emission, and comparable to existing light emitting diodes.

"The device glows at about the same brightness as a standard cathode ray tube, but brighter than a backlit liquid-crystal display", says Dr. Friend. Patterns are created by varyng the conjugation of the carbon atoms in different regions of the film, through a masking and heating process. When charged particles are injected into the film or ultraviolet light is shone on it, colours from orange to yellow are produced in various places, according to the extent of conjugation. The Cambridge team had earlier produced polymers that emit light in the blue-green range, and other researchers are reported to have produced emission at orange-red and blue wavelenghts.

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Petrochemical Plants — Economy of Scale

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Many, perhaps most of the petrochemical plants in India and the developing world are rather small and generally well below the minimum economic size. It is well known that in the case of chemical and process plants, there is a marked economy of size, i.e., capital cost per unit of capacity declines as the plant size increases (e.g. Kharbanda/Stallworthy: Capital cost estimating for process industries, Butterworth, 1988). The production cost also declines, though not as much as the capital cost, since the proportion of the raw material cost has been increasing rather fast particularly since the 70's —thanks to the oil crisis.

The exercise to determine the economic size is time-consuming, further the requisite enormous data is seldom available. However, some indication of this can be had from the capacity pattern of existing world scale plants. Such data is very scarce in the published literature, though it is available from some rather expensive publications (e.g. Standard Research Institute). A recent book (G.M. Wells: 'Handbook of Petrochemicals & Processes", Gower, 1991) includes such data.

This is summarised below. For each product, the usual range of capacities, in 000 tons/year is indicated, as also the number of plants worldwide larger than a stated capacity in the same units. In the absence of specific data, the latter number can be taken as an order of magnitude figure for the minimum economic size. This source also indicates the location of the plants and names of the licensors.

ABS: 5-160*. Number of plants larger than 60* 19, distributed thus: Belgium, France, South Korea, Taiwan and UK (1 each); Germany and Netherlands (2 each); Japan (4); US (6); (*5,000-160,000 tons/y.... 60,000 tons/y).

Acetaldehyde: 10-280. Number of plants larger than 100; 11, distributed thus: Germany, Italy, Mexico and Spain (1 each); Japan (5); US (2).

Acetic acid: 30-350. Number of plants above 200; 11, distributed thus: Canada, France, Japan, UK and USSR (1 each); US (6).

Acetic anhydride: 30-230. Number of plants larger than 120: 7, distributed thus: Japan (1); UK (2); US (4).

Acetone: 10-250. Number of plants larger than 100: 12, distributed thus: Germany, Italy, Japan, Netherlands and South Africa (1 each), US (7).

Acetylene: 3-100. Number of plants larger than 40; 18, distributed thus: Canada, China, Czechoslovakia, France, Hungary, Poland and US (1 each); Germany & Italy (2 each); USSR (3); Japan (4).

Acrolein: 2-30. Number of plants larger than 9: 5, distributed thus: France, Germany, Japan, US and USSR (1 each).

Acrylic acid: 15-200. Number of plants larger than 55: 8, distributed thus: France, Germany, Japan and Taiwan (1 each); US (4).

Acrylonitrile: 24-280. Number of plants larger than 100: 13, distributed thus: Germany, Netherlands, Taiwan, UK and USSR (1 each); Japan (2), and US (6).

Adipic acid: 40-400. Number of plants larger than 120: 7, distributed thus: France, Germany, Italy and UK (1 each); US (3).

Ammonia: 20-2000. Number of plants larger than 700. 30, distributed thus: Germany, Kuwait, Mexico, Trinidad and UK (1 each); Canada, India and Indonesia (2 each); USA (5) and USSR (14).

Aniline: 20-175. Number of plants larger than 90: 7, distributed thus: Belgium, Germany, & UK (1 each); US (4).

Benzene: 25-760. Normally adjacent to a refinery complex. Number of plants larger than 300: 23, distributed thus: Czechoslovakia, Italy, Japan, Puerto Rico and Virgin Island (1 each); Germany, Netherlands, Saudi Arabia and UK (2 each); US (10).

Benzoic acid: 3-115. Number of plants larger than 10: 8, distributed thus: Canada, Germany, Japan and USSR (1 each); Italy & US (2 each).

Benzyl chloride: 3-35. Number of plants larger than 10: 4, distributed thus: Belgium, Germany, Netherlands and US (1 each).

Bisphenol A: 60-170. Number of plants larger than 60: 11, distributed thus: France (1); Germany, Japan & Netherlands (2 each); US (4).

Butadiene: 20-270. Number of plants larger than 135: 18, distributed thus: Italy, Netherlands, Taiwan and UK (1 each); Japan & USSR (2 each); Germany (3) and US (7).

Butyl acetate: 5-42. Number of plants larger than 15: 12, distributed thus: France, Italy, Japan, Taiwan and UK (1 each); Germany (3); US (4).

Butyl alcohol: 10-180. Number of plants larger than 80: 8, distributed thus: Japan (1); Germany (2); US (5).

Caprolactam: 20-290. Number of plants larger than 90: 10, distributed thus: Germany, Italy and Netherlands (1 each); Belgium and Japan (2 each); US (3).

Carbon tetrachloride: 5-110. Number of plants larger than 30: 16, distributed thus: Belgium, Canada, France, Japan and UK (1 each); Germany & Italy (2 each); US (4); USSR (3).

Chlorobenzene: 15-80. Number of plants larger than 20: 7, distributed thus: France and Italy (1 each); Germany (2) and US (3).

Chloroform: 6-54. Number of plants larger than 25: 13, distributed thus: France, Germany, Japan, Netherlands and UK (1 each); Italy and USSR (2 each); US (4).

Cumene: 30-360. Number of plants larger than 200: 11, distributed thus: Germany, Italy, Japan, Netherlands and Sardinia (1 each); US (6).

Cyclohexane: 55-300. Number of plants larger than 100: 11, distributed thus: Belgium, Netherlands, Puerto Rico and UK (1 each); Germany & US (2 each); Japan (3).

Cyclohexanol & cyclohexanone: 90-340. Number of plants larger than 130: 'OL': 17, distributed thus: France & UK (1 each); Belgium, Italy & US (2 each); Germany (4); Japan (5).

'ONE': 15, distributed thus: Belgium, Italy & Netherlands (1 each); Germany (2); Japan (4); US (6).

Ethanolamines: 10-160. Number of plants larger than 36: 6, distributed thus: Germany, Japan and Sweden (1 each); US (3).

Ethyl acetate: 5-30. Usually includes other aliphatic acetates. Number of plants larger than 15: 8, distributed thus: France and UK (1 each); Japan (2); US (4).

Ethyl alcohol: 5-155. Number of plants larger than 60: 13, distributed thus: Canada, France, Japan, Saudi Arabia, Scotland, UK and USSR (1 each), China, Germany and US (2 each).

Ethylbenzene: 20-770. Number of plants larger than 500: 11, distributed thus: Germany, Netherlands and Saudi Arabia (1 each); Japan (3) and US (5).

Ethyl chloride: 3-70. Number of plants larger than 40: 4, distributed thus: Mexico and UK (1 each); US (2).

Ethylene: 30-1315. Number of plants larger than 600: 26, distributed thus: Canada, Italy, Saudi Arabia and Taiwan (1 each); Germany, Netherlands and UK (2 each); US (15).

Ethylene dichloride: 50-1220. Number of plants larger than 400: 19, distributed thus: Netherlands and Norway (1 each); Belgium and France (2 each); Japan (4); US (9).

Ethylene glycol: 15-630. Number of plants larger than 200: 16, distributed thus: China and Japan (1 each); Canada, Saudi Arabia and USSR (2 each); US (8).

Ethylene oxide: 20-400. Number of plants larger than 185: 20, distributed thus: Canada, Netherlands, Puerto Rico, Saudi Arabia and UK (1 each); Japan (2); USSR (4) and US (9).

Ethylene ether: 5-40. Number of plants larger than 15: 7, distributed thus: France, Germany, Japan, South Korea, Taiwan, UK and US (1 each).

2-Ethyl hexyl alcohol: 10-200. Number of plants larger than 90: 9, distributed thus: France & Sweden (1 each); Japan and US (2 each); Germany (3).

Formaldehyde: 5-270. Number of plants larger than 170: 15, distributed thus: Sweden (1); Italy & Netherlands (2 each); Germany & Japan (3 each); US (4).

Formic acid: 6-100. Number of plants larger than 10: 13, distributed thus: Finland, Italy, Malaysia, Norway, South Korea, Taiwan, UK, US and USSR (1 each); Germany and Japan (2 each).

Glycerol: Synthetic glycerol plants 8-60. Number of plants larger than 16: 7, distributed thus: Egypt, France, Japan, US and USSR (1 each): Germany (2).

Hexamethylenediamine: 75-230. Number of plants larger than 80: 8, distributed thus: France & UK (2 each); US (4).

Isopropyl alcohol: 30-300. Number of plants larger than 100: 11, distributed thus: France, Japan, Mexico, Netherlands and UK (1 each); Germany (2), US (4).

Maleic anydride: 3-90. Number of plants larger than 20: 15, distributed thus: Belgium, France, Germany, Italy, Korea, UK and USSR (1 each); Japan (3) US (5).

Methyl alcohol: 60-825. Number of plants larger than 500: 18, distributed thus: Chile, Germany, Iraq, Libya, Malaysia, Netherlands, New Zealand and UK (1 each); Canada, Saudi Arabia and USSR (2 each); US (4).

Methylamines: 10-90. Number of plants larger than 30: 6, distributed thus: Belgium, Germany, Japan and UK (1 each); US (2).

Methyl chloride: 6-90. Number of plants larger than 30: 13, distributed thus: France, Japan and UK (1 each); USSR (2); Germany (3); US (5):

Methylene dichloride: 10-100. Number of plants larger than 30: 13, distributed thus: Japan and UK (1 each); France, Germany & USSR (2 each); US (5).

Methyl ethyl ketone: 10-90. Number of plants larger than 40: 13, distributed thus: Germany, Netherlands, Taiwan and UK (1 each); France (2); Japan (3); US (4).

Methyl isobutyl ketone: 10-25. Number of plants larger than 14: 9, distributed thus: Italy, Netherlands, Japan and UK (1 each); France (2); US (3).

Methyl methacrylate: 20-300. Number of plants larger than 50: 11, distributed thus: France, Italy and UK (1 each); Germany (2); Japan and US (3 each).

Methyl tert-butyl ether: 15-500. Number of plants larger than 250: 11, distributed thus: Canada, France, Netherlands, Saudi Arabia, USSR and Venezuela (1 each); US (5).

Nitrobenzene: 5-240. Number of plants larger than 80: 9, distributed thus: Germany & UK (1 each), Belgium (2), US (5).

Perchloroethylene: 10-100. Number of plants larger than 35: 12, distributed thus: France, Japan and UK (1 each): Italy (2); Germany (3); US (4).

Phenol: 30-400. Number of plants larger than 180: 9, distributed thus: Italy, Germany, Japan and Netherlands (1 each), US (5).

Phthalic anhydride: 10-120. Number of plants above 74: 15, distributed thus: Belgium, France, Italy, South Korea, UK and USSR (1 each); Germany, Japan (2 each); US (5).

Polyethylene: *HDPE & LLDPE:* 20-530. Number of plants larger than 200: 31, distributed thus: Belgium, Germany, Japan, Spain, Sweden, Taiwan and UK (1 each); Netherlands, Saudi Arabia and USSR (2 each); Canada (3); US (15).

LDPE: 20-400. Number of plants larger than 200: 25, distributed thus: Austria, Finland, France, Japan, Mexico and Saudi Arabia (1 each); Belgium, Germany, Netherlands and USSR (2 each); US (11).

Polypropylene: 10-520. Number of plants larger than 180: 23, distributed thus: Austria, Canada, France, Netherlands, Singapore, South Korea, Spain and Taiwan (1 each); Italy and Japan (2 each); Belgium (3); US (8).

Polystyrene: 40-315. Number of plants larger than 140: 16, distributed thus: Belgium, France, Italy and USSR (1 each); Germany & Japan (2 each); US (8).

Polyvinyl chloride: 35-680. Number of plants larger than 180: 25, distributed thus: Belgium, France, Japan, Netherlands, Saudi Arabia and South Korea (1 each); Brazil and Taiwan (2 each); Germany and USSR (3 each); USA (9).

Propylene: 22-520. Number of plants larger than 310: 24, distributed thus: Canada, France, Italy, Taiwan, UK and USSR (1 each); Germany (2); Netherlands (3); US (13).

Propylene glycol: 15-145. Number of plants larger than 40: 12, distributed thus: France and Netherlands (1 each); Japan (2); Germany (3); US (5).

Propylene oxide: 30-550. Number of plants larger than 125: 10, distributed thus: France and Japan (1 each); Germany and Netherlands (2 each); US (4).

Styrene: 30-690. Number of plants larger than 330: 18, distributed thus: France and Italy (1 each); Canada, Germany, Netherlands and USSR (2 each); Japan (3); US (5).

Terephthalic acid and dimethyl terephthalate: PTA: 50-630. Number of plants larger than 240: 12, distributed thus: Mexico, South Korea and UK (1 each): Japan, Taiwan and US (3 each).

DMT: 60-870. Number of plants larger than 100: 15, distributed thus: Italy, Japan, Mexico, Netherlands, Rumania and USSR (1 each); Germany (4); US (5).

Toluene: 10-600. Number of plants larger than 140: 25, distributed thus: Italy, Korea, Mexico, Netherlands, Portugal, Spain, Taiwan and Virgin Islands (1 each); Canada (2); Germany and Japan (3 each); US (4) and USSR (5).

2,4-Tolylene diisocyanate (TDI) and dimethane diisocyanate (MDI) 10-75. Number of plants larger than 35: 10, distributed thus: UK (1); France, Italy and US (2 each); Japan (3).

Trichloroethylene: 10-75. Number of plants larger than 35: 10, distributed thus: UK (1); France, Italy and US (2 each); Japan (3).

Urea: 100-900. Number of plants larger than 600: 25, distributed thus: Bulgaria, China, Indonesia, Iran, Iraq, Kuwait, Netherlands, Poland, Qatar, South Korea, Turkey and Venezuela (1 each); US (2); India (5) and USSR (6).

Vinyl acetate: 20-280. Number of plants larger than 90: 14, distributed thus: Canada, China, France, Germany, Taiwan, and UK (1 each); Japan (3), US (5).

Vinyl chloride: 30-480. Number of plants larger than 300: 20, distributed thus: Belgium, Canada, France, Japan, Netherlands, Norway, Saudi Arabia, Taiwan and USSR (1 each), Germany (2); US (9).

Xylene: *o-xylene:* 8-122. Number of plants larger than 100: 11, distributed thus: France, China, Japan and Netherlands (1 each); Germany and US (2 each); USSR (3).

p-xylene: 20-570. Number of plants larger than 200: 16, distributed thus: Brazil, Canada, China, Mexico, Puerto Rico, Taiwan, UK (1 each); Japan (4); US (5).

Speciality Leathers from Buffalo Hides*

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With the development of the dairy industry, the buffalo has emerged as an important milk animal accounting for more than 50 per cent of the total milk production, although in terms of numbers, it accounts for 26.4 per cent in the total bovine stock (1982). With its annual growth rate of 1.7 per cent compared to 0.5 per cent of cattle, there are strong indications that buffalo would emerge as the future bovine animal of India. Accordingly the Indian Leather Industry can look forward to increased supplies of buffalo hides and buff calf skins. There is a total availability of 15.7 million hides per annum in our country now and the position of livestock of buffalo and cattle is given below:

India's share in the world livestock — 1982

Species	India (in million heads)	World (in million heads)	India's share in the world (%)	Rank in the world
Buffalo	69.8	123.6	56.5	1
Cattle	194.4	1225.1	15.9	1

Generally, the buffalo hides in the past were used only for making vegetable tanned sole leathers and industrial leathers. But these leathers are now gradually replaced by synthetics. The recent trend also indicates that there is a short supply of finished leathers from other species. To meet the increasing demands of finished leathers, the buffalo hides can be utilised to manufacture different types of finished leathers like softie upper, shrunken grain upper, garment leathers and upholstery leathers for better value addition. There are certain drawbacks associated with the buffalo like, higher incidence of grain defects, growth marks, rough grain due to grain papillation etc. However, the grain is quite tender and very much receptive to the various chemical treatments. The other problems associated with the buff hides are open structure, looseness of the flanks and low angular weave. Modifications are required in processing the buffalo hides to produce quality leathers and also to achieve significant upgradation of lower ends. By introducing splitting operation in the limed stage, the split recovery will be much greater and splits recovered can be processed into shoe suede, finished split leathers for upper and leather goods.

Structure of buffalo hides

The buffalo hides are thicker than the cattle hides of equal weight and contain less grease. There are two types of hairs formed in buffalo hides. One is longer or coarser and the other is shorter or finer. The longer hair goes down a little below the junction of the grain and the corium and the fine hairs develop in the layers near the fat gland. The epidermis is highly pigmented. The roughness of buffalo grain is due to the fact that the epidermis is highly papillated. The coarseness is more pronounced in the shank and belly than elsewhere. The epidermis constitutes about 1-2 per cent of the total thickness of the hide. But the grain membrane constitutes only 0.02 per cent of the total thickness of the hide. This is considerably very thin. The corium proper constitutes approximately 75-90% of the total thickness and percentage varies over the entire area. The grain layer covers 6-24% of the total thickness. The hairs are not so many in buffalo and the glands too. The cells of the fat gland are not enclosed in common sac and scattered all over the place. Though the sweat glands are lesser in number, they are bigger in size in the buffalo hide. The collagen fibre bundles in the corium are not woven very compactly and run at lower angles to the grain surface. It varies between 0-70°. The buffalo hides are porous because of the lower angulation and less compactness of the texture. This is less greasy because the fat droplets are not usually found in the corium.

Softy upper leather

The softy upper leathers should possess all the important properties of an upper leather and in addition greater degree of softness without much stretch. As the grain of the buffalo hide is quite rough due to grain papillation, it is required to be softened at various stages of processing. The process developed in CLRI has the following important features:

1. **Lime splitting**
   The objective is to enable the stock to receive uniform and better treatment in the subsequent operations and also to recover higher percentage of splits for better utilisation.
2. **Urea treatment**
   For better opening up of fibre knit.
3. **Deliming with ammonium chloride**
   To produce calcium chloride during deliming which has lyotropic effect (breaking hydrogen bonds of collagen).
4. **HCl pickle**
   For better opening up of fibre structure.
5. **Retanning with mineral syntan**
   To achieve fluffy feel.

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* Paper presented at the 27th Leather Research Industry Get-together, in Madras in January 1992.

6. **Greater degree of neutralisation**
   For better softness in the final leather.
7. **Fatliquoring with special synthetic fatliquors**
   For better lubrication and fastness properties.
8. **Finishing with organic pigment/dye**
   To finish the leather without loading up the grain.
9. **Using soft resin binders**
   To get a softer feel without affecting the softer feel.
10. **Top coat with good flexibility**
    To get a greater degree of flexibility to the finish.

The results of both physical testing and chemical testing data are quite good. The other characteristics like smoothness of the grain, softness of the leather and strength properties are quite satisfactory.

Shrunken grain leather

The shrunken grain leathers can be made from buffalo hides also. In the process of shrunken grain leather, the tannage is deliberately adjusted to get a coarse patterned grain with marked ridges and depressions in the place of usual smooth grain. It is generally produced in tannage using selected syntans/vegetable tans followed by chrome tannage. The shrunken effect or the desired pattern of the grain is influenced by mechanical action in the early stages of tannage. The type, concentration and acidity of tan liquor play an important role in either enhancing or controlling the shrunken effect. The shrinkage can occur due to the contraction of the not yet tanned corium due to the action of syntan/vegetable tans.

Importnat features of the process

1. **Moderate liming**
   To achieve just the objects of liming.
2. **Lime splitting**
   To enable the stock to receive uniform treatment in the subsequent operations.
3. **Deliming with ammonium chloride**
   To get softer feel in the final leather.
4. **Pickling**
   As usual to a pH value of 2.8-3.0.
5. **Depickling**
   To condition the pelt and to raise the pH to 4.5.
6. **Dry drumming with saw dust**
   To reduce the moisture content.
7. **Syntan treatment with formic acid and formaldehyde**
   To get the shrunken effect.
8. **Tanning with pre-basified chrome liquor**
   For completion of tannage since vegetable/synthetic tanning material gives only surface tanning effect.

In the case of shrunken grain produced with vegetable tannins, the moisture content is reduced by dry drumming with saw dust after deliming and washing and acidification to a pH value of 4.5. Then treated with myrobalan nuts/wattle extract with formic acid and followed by chrome tanning and basification. After the wet operations, the leathers are piled overnight and on the following day the leathers are dried as such without setting and then sawdusted, staked and dry drummed to get the shrunken grain more prominent by the mechanical action uniformly throughout the side. Then they are finished in resin finish as usual. These leathers can be used either for footwear or for making leather goods.

Grain garment leathers

The specification for the fabrics meant for garments are classified into two groups namely, properties and characteristics. The property is a static physical dimension and the characteristics are defined as stress strain qualities, such as elongation, strength etc. Even though the characteristics of fabrics are more relevant for garment making the properties are related to characteristics. The important characteristics of grain garment leather are drape, softness, strength properties, light weightedness, light fastness, wet and dry rub fastness. The important features of the process are as follows:

1. **Moderate liming**
   To achieve the objects of liming and to avoid accentuation of natural growth marks.
2. **Lime splitting**
   To enable the stock to receive uniform treatment in the subsequent operations and also to recover high percentage of splits for better utilisation.
3. **Deliming with ammonium chloride**
   To get better softness in the final leather.
4. **Alkaline bating**
   To get a smoother grain and better softness.
5. **Acetic acid treatment**
   To increase the fibre splitting for better softness of the final leather and to knock down the grain.
6. **Urea treatment**
   For effective splitting of fibre bundles and to achieve greater degree of softness.
7. **Chrome tanning with higher percentage of cationic fatliquor**
   To achieve even distribution of chrome and to impart more softness to the leather.
8. **Higher degree of Neutralisation**
   To achieve more softness by better lubrication of fatliquor.
9. **Special type of synthetic fatliquors**
   For better softness and light weightedness and fastness.
10. **Retanning with special syntans**
    To import fluffy feel without loading up the grain.
11. **Dyeing with metal complex dyestuffs**
    For better light fastness.
12. **Finishing with organic pigments and soft resin binders**
    To get desired finishing properties without loading the grain and affecting the original softness of the leather.
13. **Top coat with PU based emulsion**

The process developed for the production of grain garment leather from buff hides, has yielded good results with regard to drape, softness, smoothness of the grain, strength properties, rub fastness etc.

Upholstery leathers

The production of upholstery leathers is an area where the techniques of production and finishing have changed over the years. The traditional upholstery leather was made from vegetable tanned with protein finish initially and acrylic and NC finishes later. In olden days very stiff and rigid leathers were made for upholstery, but the furniture industry has brought about a radical change in the Scandinavian countries and US. Chrome tanning has become more and more popular becasue of its well-known advantages. The upholstery leathers can be classified into three categories namely, (i) upholstery leather for aircraft seats, (ii) upholstery leather for automotive industry and (iii) upholstery leather for furniture industry. Very high demanding properties are required now-adays for an upholstery leather. The stiff competition from synthetics has pushed the leather upholstery to the luxury area where the leather upholstery has to exhibit the superior qualities like good tensile strength, good wet and dry rub fastness, light fastness, scuff resistance with optimum extensibility without flabby appearance on use and fire resistance with nappa feel. In view of larger area and peculiar grain pattern of the buffalo hides, they can be utilised for making speciality leathers like upholstery leather.

The important features of the process developed for the production of upholstery leather are as follows:

1. **Lime splitting**
   To achieve uniform thickness and to enable the stock to receive uniform treatment in the subsequent operations and also to recover high percentage of splits for better utilisation.
2. **Urea treatment**
   For better opening up of fibre bundles.
3. **Alkaline bating**
   To soften the grain.
4. **HCl pickle**
   For better opening up of fibre structure in order to get more softness in the final leather.
5. **Addition of acid stable fatliquor in pickle**
   To emulsify and distribute the natural fat and also to impart more softness to the leather.
6. **Addition of special acid stable fatliquor in chrome tanning**
   To get better softness in the final leather.
7. **Retanning with chrome syntan**
   To get a fluffy feel in the final leather.
8. **Use of special type of synthetic phosphated fatliquor**
   For better lubrication, fastness, light weightedness and softness and fire resistance.
9. **Use of premetallised dyes in dyeing**
   To get better light fastness property.
10. **Use of acrylic and PU binder in finishing**
    To get better rub fastness and scuff resistance.
11. **Use of PU based top coat**
    For better rub fastness and scuff resistance of the finish.

The leathers processed have yielded very satisfactory results with regard to the important characteristics of upholstery leather. To sum up, the buffalo hides can be utilised for making various newer types of leathers like softy upper leathers, shrunken grain leather, grain garment and upholstery leathers by modifying suitably the processing techniques so as to impart the essential functional properties to the leathers. Approaches for modifying the pre-tanning, tanning and post-tanning operations for these types of leather have been indicated in this paper and the processing technology is available with CLRI for the industry.

Globalisation of Pharmaceutical Industry — Opportunities & Challenges

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PHARMACEUTICAL INDUSTRY — SALIENT FEATURES & EVOLUTION

The Pharmaceutical Industry is rightly called the 'lifeline' industry for its crucial role in manufacturing of products designed to alleviate and/or prevent human suffering.

Modern pharmaceutical industry is the late child of the first industrial revolution and developed in the West. The industry originated in 1930s and witnessed a major growth during the fifties and the sixties. Thereafter the growth rate declined due to:

i) Elevation in the scientific standards of proof and
ii) High costs to meet the current scientific standards and regulatory demands.

There exists a huge gap in the consumption and production of drugs worldwide. For example in 1985, 1.2 billion people living in developed countries consumed drugs worth 75 billion dollars whereas 4 billion people in developing countries consumed just 20 billion dollars worth of drugs.

The Pharmaceutical Industry differs from the chemical processing industry mainly in its use of biotechnological processes than basic chemical processes. Further, it has a greater variety of processes and more complicated chemical steps than other sectors. It is, therefore, highly technology intensive. Apart from availability of raw materials or appropriate finances, one needs to have the relevant technology and skilled personnel to venture in this sector. This is precisely why the developing countries account for just 12% of the world's drug production.

Products

Antibiotics are the most important class of drugs used due to the prevalence of pathogenic diseases. The other classes of drugs include cardiovasculars, antiarthritics, phychotherapeutics, antihistaminics, vitamins, analgesics, hormones, tonics etc.

Scenario in developing countries

In the approximately 110 developing countries, the industry has developed to varying degrees.

* 10 countries have both formulations & bulk drug production
* 50 countries have only formulation plants
* Rest depend entirely on imports

Argentina, Brazil, Egypt, India, Republic of Korea and Mexico have established vertically integrated industries.

GLOBAL REVIEW OF MANUFACTURING AND CONSUMPTION OF PHARMACEUTICALS

Global expenditure on health care is unevenly distributed. The developing countries which account for nearly 75% of the World's population consume about only 25% of the World's drug production. The major reasons for this are:

i) High cost of production of drugs
ii) Low ratio of medical personnel to overall population
iii) Lower earnings per capita
iv) Lack of access to health care facilities (particularly in rural areas).

Global exports and imports of Pharmaceuticals

It is evident from the Table 1 that the developing countries account for a very low share of pharmaceutical exports while the developed countries have the major share. Similarly the developed countries have a major share of World's imports. However, the imports of formulations by developing countries is gradually reducing (See Tables 1 and 2).

THE INDIAN PHARMACEUTICAL INDUSTRY

Evolution

The Indian Pharmaceutical Industry is relatively small, at about 2% of the World market, although India has 15% of the world population. With the population likely to reach 1000 million by 2000 A.D., it is one of the largest potential markets for pharmaceuticals in the world.

In the last 44 years since independence, the industry has grown from a turnover of just Rs. 10 crore (1947) to Rs. 3600 crores (in 1991). From simple headache pills to sophisticated antibiotics and complex molecules for cardiac therapy, almost every modern dosage form and drug is now produced in India. Operationally, it has evolved from repacking, tableting and

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Table - 1
GLOBAL VIEW OF PHARMACEUTICAL EXPORTS

No.	Product	Year	World Exports (Million dollars at 1980 constant)	% Share by Developed nations	% Share by Developing nations	% Share by Others
1.	Vitamins	1970	378	96.0	1.5	2.5
		1980	861	95.7	1.0	3.3
		1984	1103	96.0	0.4	3.6
2.	Antibiotics	1970	639	90.0	6.1	3.9
		1980	1515	85.0	9.1	5.9
		1984	1777	89.0	5.2	5.8
3.	Alkaloids	1970	517	86.2	9.5	4.3
		1980	601	88.0	6.2	5.8
		1984	710	87.3	6.0	6.7
4.	Formulations & other goods	1970	4532	94.0	4.7	1.3
		1980	9784	88.8	5.5	5.7
		1984	11716	95.1	3.8	1.1

Table - 2
GLOBAL VIEW OF PHARMACEUTICAL IMPORTS

No.	Product	Year	World Imports (Million dollars at 1980 constant)	% Share by Developed nations	% Share by Developing nations	% Share by Others
1.	Vitamins	1970	424	77.0	19.0	4.0
		1980	967	72.5	22.5	5.0
		1984	1207	77.3	19.1	3.6
2.	Antibiotics	1970	647	70.0	26.4	1.6
		1980	2070	72.0	21.0	2.0
		1984	2559	77.0	15.0	3.0
3.	Alkaloids	1970	492	82.0	15.0	3.0
		1980	640	80.0	19.7	0.3
		1984	780	82.0	16.5	1.5
4.	Formulations & other goods	1970	4904	57.5	39.0	3.5
		1980	10008	56.5	45.5	8.0
		1984	12166	67.0	30.0	3.0

mulations from imported bulk drugs to integrated production processes including basic drug manufacturing of synthetic drugs.

In the process, the industry has made a notable contribution to the improvement of general health. Thus, while in the pre-1947 period, India had a high incidence of diseases like cholera, small pox, malaria, T.B., leprosy etc., today a range of prophylactic & therapeutic preparations are available to treat these diseases. Diseases like small pox and plague have been virtually eradicated.

The Industry has made successful forays into advanced technologies like controlled release, sustained release and targeted drug delivery systems. Some of the organizations have entered hi-tech areas like genetic research and biotechnology. India now produces 95% of the drugs considered essential by WHO.

Important Statistics

The evolution of Industry, over the past four decades, will be evident from the Tables 3, 4, 5 as also Figures 1 and 2.

Table - 3
DRUG INDUSTRY - GROWTH INDICATORS

(Rs. Crores)

Item	1947-48	1965-66	1990-91
Capital Investments	24	140	900
Production			
1. Formulations	10	150	3600
2. Bulk drugs	--	18	700
Imports	--	8.20	652
Exports	1.27	3.05	785
R&D Expenditure	3.0	6.0	60

Table - 4
EMPLOYMENT IN INDUSTRY

	1970-71	1988-89
Total	4,00,000	10,00,000
Direct	2,00,000	3,00,000
Indirect		
1. Trade	2,00,000	5,00,000
2. Ancillary industries	--	2,00,000

Table - 5
HEALTH INDICATORS

Item	1960-61	1986-87	1999-2000 Target
Life expectancy (years)	41.2	58.6	64
Infant mortality (per 1000 live births)	146	96	60
Death rate (per 1000)	22.8	11.1	8.2
Birth rate (per 1000)	41.7	32.6	23.1

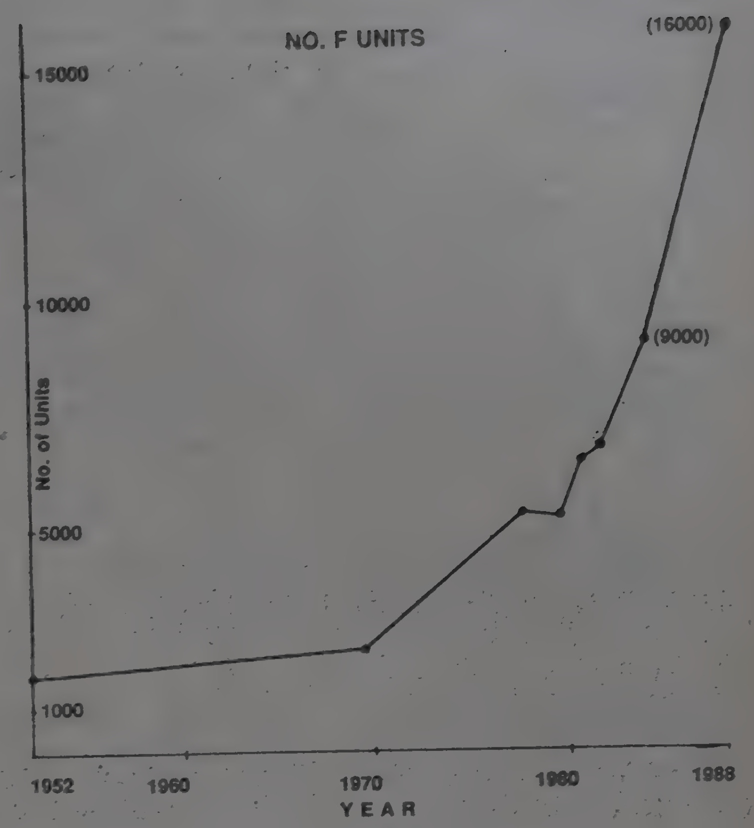

Fig. 1

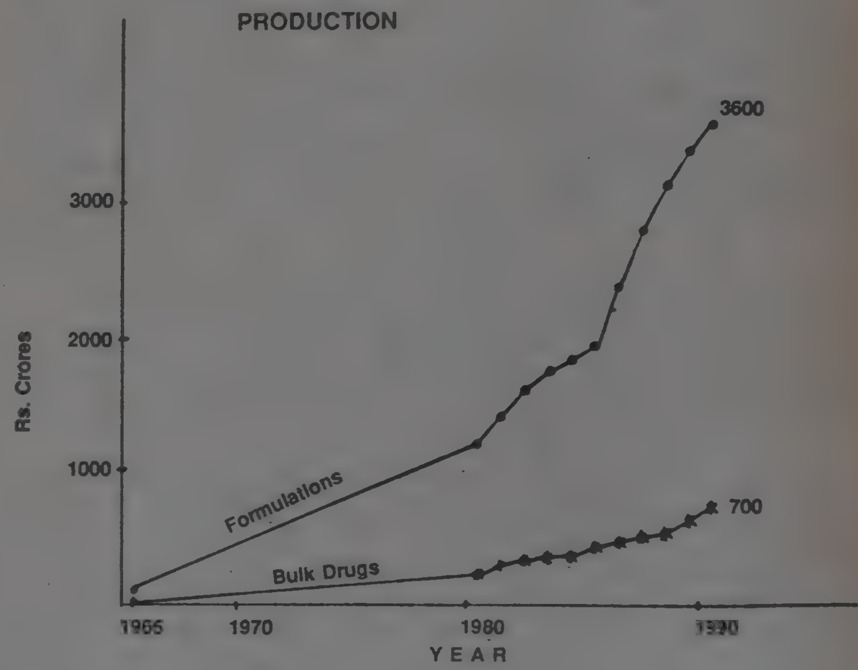

Fig. 2

Structure

Since India has adopted the principle of planned mixed economy, both the public and the private sector are involved in the pharmaceutical manufacture.

About 31 companies have foreign equity holding while many more have technical collaboration agreements. Owing to FERA restrictions, the number of FERA companies has reduced from 45 in 1978-79 to just 5 in 1990-91. The estimated share of various types of companies is as shown in Table - 6.

CURRENT STATUS AND PROBLEMS OF INDIAN PHARMACEUTICAL INDUSTRY

Among the developing countries, the Indian Pharmaceutical Industry is already a leader in terms of the wide range and high quality of medicines it produces. Some of the leading Indian companies have become multinational by setting up joint ventures abroad and exporting technologies, management, technical skills and products. Most of the multinational corporations operating in India started their activities in the late fifties and early sixties. Thereafter, the influx of foreign equity in India receded until recently when interest in the Indian Pharmaceutical market is being rekindled owing to the Government liberalisation measures on a sectoral basis.

However, there are many reasons why production of both bulk drugs and formulations have not increased to the extent they should have. A few important reasons are:

Table - 6
STRUCTURE OF INDUSTRY

Type of companies	% share of market	
	Bulk drugs	Formulations
Public Sector	16	6
Private Sector		
1. Organised	62	68
1. Unorganised	21	26

Fixed Prices

Price control in India has a chequered and long history beginning in 1962 and continued since then in a rigorous manner.

As per the Drugs (Price Control) Order 1978 and its subsequent amendments in 1979 and 1987, the various drugs are classified into three categories I, II and III, [*subsequently reduced to two-ED*]. These categories have specified mark up on the basic manufacturing price. Thus, the drug industry is deprived of pricing flexibility. Revision of prices is also a long drawn process requiring a minimum of six months. The net result of these restrictions along with external effects like devaluation of rupees, increasing input costs etc. is the declining profitability of industry as shown in Table - 7.

Table - 7
PROFITABILITY OF PHARMACEUTICAL INDUSTRY

Year	PBT as % of sales	Source
1969-70	15.47	Hathi Committee
1975-75	10.7	
1977-78	11.7	RBI Bulletin
1980-81	8.8	
1982-83	7.5	
1983-84	6.7	NCAER Study
1984-85	5.8	A.F. Fergusson Study
1985-86	4 to 5	OPPI Estimate
1986-87	3 to 4	
1987-88	3.5	
1988-89	2.8	OPPI Study
1989-90	3.5	

Inadequate distribution sub-system

More than 70% of India's population is denied free access to modern medicines due to an inadequate distribution system. Moreover, the lobby of wholesalers and chemists is strong and demands higher margins. On the other hand, the Government health centres and clinics do not have adequate budgets.

Irrational product-mix of formulations

There are a number of combinations of drugs under brand names while the essential drugs are far less in number. For example, while there is only one drug effective against filariasis available to 200 million Indians exposed to filarial infections, 50 antihistaminics are available under different brand names.

Poor Petrochemical Base

The main reason for the high cost of Indian synthetic bulk drugs is the high cost of petrochemical products arising out of low indigenous production volumes and high import duties.

OPPORTUNITIES AND CHALLENGES

As the Pharmaceutical industry prepares itself to enter the 21st century, it is presented with many opportunities and a few challenges, some of which I shall present here.

The Dunkel Proposals

In January 1992, Arthur Dunkel, the Secretary General of the GATT (General Agreement on Tariffs & Trade) presented his proposals at the Uruguay Round. These proposals relate to trade practices between nations and involve issues like TRIPS (Trade related intellectual property rights) and TRIMS (Trade related investment measures). While TRIPS essentially cover trade marks, copyrights and patents, the TRIMS govern issues like phased manufacturing programmes.

The Dunkel recommendations seek to allow market driven forces to operate in the international trading system. They seek to eliminate all quantitative restrictions on imports of goods (except in an adverse BOP situation) and do away with export subsidies (except in countries with per capita income below $ 1000 or countries with less than 3.25% share of global exports for 2 successive years.)

Two of the specific proposals affecting Indian industry are:

1. All products would be patented for 20 years and here would be a 10 year transition period before these stipulations come into effect.

2. Plant Breeder Rights will be applicable to India also. (It means that a hybrid seed can be patended).

There have been very strong reactions for and against these proposals from various organisations. The most contentious

issue is, of course, the change in the Indian Patent Act, 1971 which will be necessary if India accepts the Dunkel proposals. The Indian Patent Act, 1971 provides patent protection for processes and not products. The protection is offered for 7 years for foods, drugs and pharmaceuticals while for other products it is for 14 years. It also states that for a patent to work in India, it had to be produced in India.

The Dunkel proposals will change all this. So far the Indian companies had the freedom to manufacture patented products as long as they developed their own process technology. These companies will now be denied this opportunity.

The IDMA has contested that the Indian Patents Act 1971 has enabled the development of a dynamic drug industry and any change in the act will benefit the multinational corporations and crush the Indian sector. On the other hand organisations like CII, FICCI and ASSOCHAM have welcomed these proposals. They claim that the Indian producers have been freely profiting from the inventions of other countries. Although this has led to building up of manufacturing capabilities, it has resulted in a gross neglect of research capabilities. The Government's protectionist policies have helped proliferation of the small scale unorganised sector which cannot afford to invest in quality resulting in productuion of inferior and even-spurious drugs as revealed by the Lentin Commission's findings.

Opening up of the pharmaceutical industry through the acceptance of Dunkel proposals will bring in the much needed competition which will ultimately benefit the customer. It will force the industry irrespective of their type, whether Indian or Multinational, to upgrade its research capabilities and offer quality products. Moreover, it must be understood the currently 95% of drugs produced in India are off-patent and even for the remaining 5%, alternatives are available which are both off-patent and effective.

Accepting these proposals would give great boost to Indian inventors and thus help build a research infrastructure.

Thus, in a nutshell, the Dunkel proposals present a unique challenge. It is a calculated risk that India needs to take if it desires to truly globalise. Undoubtedly, there will be a few casualties but in the long run it will benefit the industry in many ways.

Pricing Policies

The Indian Pharmaceutical Industry is subject to a dual control:

1. Product-wise price control and
2. Control on overall profitability.

Currently about 75% of the drugs marketed in the country are under price control. Also price revisions take a substantial time since each manufacturer has to apply to Government for any change in the price of any of his products while the Government does not have adequate administrative machinery to discharge this voluminous task. Thus, the Industry's profitability is on the decline.

It is here that the Government needs to take bold policy initiatives. A set of suggestions from Dr. Agarwala, past President of OPPI to the policy makers are worth mentioning here.

a. Automatic Price Adjustment

It is unrealistic to expect a general reduction in drug prices in an inflationary economy. The Government should, therefore, evolve a concept of automatic approval of prices based on self-regulation by the Industry within the broad guidelines laid down by the Government. This will save a considerable time in price approvals and the industry can also function under conditions of greater certainty.

b. Price Decontrol

About 25% of products marketed in the country to-day are free from price control. The Government should progressively increase this percentage till all the products are free from price control. An overall ceiling on profitability can continue without any specific drug price control.

Since we have thousands of producers large, medium and small, the decontrol of prices will not lead to an unrealistic shooting of drug prices.

Quality, Technology and Exports

These are the three issues which cannot be separated from each other. India needs to increase exports in a substantial measure. India's exports performance, over the years, is shown in Fig. 3.

India needs to multiply its exports in a short span of time. This presupposes a substantial upgradation of the quality of drugs it produces. It is here that technology plays a key role. This is so because the drug manufacturing technology has a vital bearing on the cost of production as well as the quality and safety of drugs produced. The recent study by NCAER (National Council for Applied Economic Research) has revealed that although India has a well developed drug manufacturing capability, it needs to update the existing technology for manufacture of conventional and newer antibiotics, synthetic drugs, corticosteroids, vitamins and immunologicals. Sophisticated drug delivery systems also need to be developed.

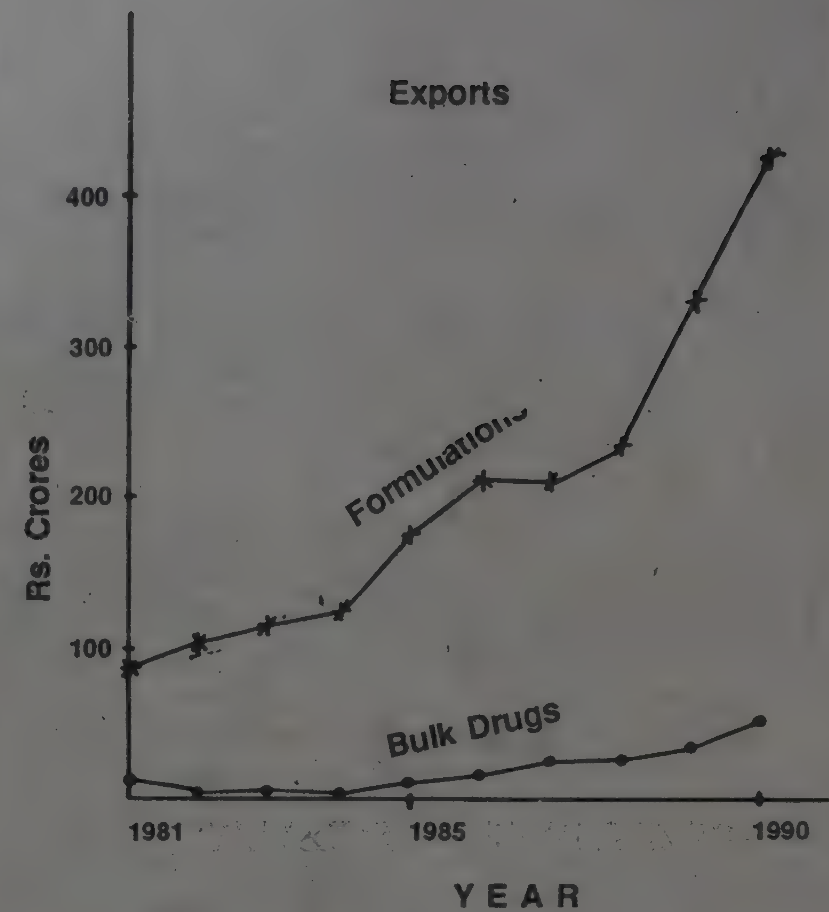

Fig. 3

India lags far behind in international standards in the fermentation technology used for manufacture of antibiotics, steroids, vitamins and enzymes. This is primarily due to inferior quality of microbial strains, fermentation techniques, down stream processing and recovery methods.

India needs to bridge this gap in technology economically, quickly and effectively with the objective of becoming a world leader. This can be achieved through technology transfers both technical and financial. These newer technologies further need to be assimilated, absorbed and improved upon. One major advantage that India possesses is the abundant availability of scientific and technical personnel who are under-utilized due to a lack of industrial culture and environment in which innovation and enterprise are rewarded.

The Government on its part needs to liberalise the industry from price control so that adequate profitability of industry is assured. Unless this happens, funds for research and development would not be available. It should foster international collaboration agreements to help bridge the technology gap.

Such policy changes will bring forth the entrepreneurial capabilities in India and lead to achieving the objective of 'Health for all by 2000 A.D.' I have no doubt that if Japan can do it, we can do it as well.

The Role of the Service Industry Sector

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I take this opportunity to thank the organizers for this opportunity to present my observations and views on the 'ROLE OF THE SERVICE INDUSTRY' towards the successful globalization process of the Indian Chemical industry. For the purpose of this seminar, I have described the scope of the service industry for the chemical industry as consisting of:

* Technology Search and Transfer
* Project Planning and
* Basic and Detailed Engineering Including
  -- Procurement, Supervision, Pre-investment and Market surveys and,
  -- Similar Related Activities

which currently includes .....

-- environment impact analysis
-- safety
-- confirmation to world standards, etc.

In the current seminar I have limited myself to the above scope of work and have not connected the service industries with .... Banking, Finance, Transportation, Export-Import, Personnel, etc. ..... Somehow for the programme outline before us this aspect of the service industry has not found significance; however, I believe that the aspect of the globalization could and should not escape the serious attention of the Indian Institute of Chemical Engineers.

The Indian industry's history and growth path has been discussed at great length in earlier seminars and it indicates generally that the industry, from a small and modest beginning in the early '20s has currently reached a level of great significance for the domestic as well as international market segments served by the industry.

In the course of the growth, we are currently facing a diverse range of industries existing side-by-side. Highly advanced technologies connected with bio-technology or petrochemicals or synthetic fibre or drugs and pharmaceuticals and chemicals connected with electronics and space are on one side and ancient chemical industries still using old processes and plants and producing classical chemicals and producing hazards as well as pollution exist on the other side. It is in this context that I wish to enumerate some significant needs for the successful, globalization of the chemical industry in India.

a) Need for Technology Upgradation
b) Timely Work Completion
c) Specific Budget and Cost Control Objectives
d) Quality and Efficiency of the Product

Other aspects which need consideration are:

i) pollution control and environment protection
ii) safety of process and personnel and of the product
iii) expansion, side-by-side with operating plants
iv) modernization of existing facilities
v) Upgradation of storage methods, packaging methods and the transport of chemicals to the end users destination

I will discuss each of the above in my observations and would like to convey that the small industries are becoming larger and the large ones are becoming world class in nearly every aspects of the Indian enterprise and this also poses several challenges and opportunities!

(A) The Need for Technology Upgradation

The Indian industries have grown essentially with technology bought from others and very little, if any, originating from the Indian effort, development, research and operational simplifications. I can see that nearly all the plants on the Thane-Belapur belt near Bombay are based on technology available from operating plants overseas and in the last 20 years or so, hardly any upgradation has been achieved in any of these plants. Even some of the major plants have remained stagnant; capacity-wise and also quality-wise. Therefore, to meet with world standards of quality and speed of delivery, one has to increase the size and introduce new technology.

If it needs purchase,
If it needs collaboration, or
If it needs development or research,

the same can be undertaken by the industry.

(B) Timely Work Completion

It is our observation in the last three decades of our participation in the growth of the chemical industry in India that timely work is rarely achieved and there are a number of con-

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straints to achieve timely completion of plants and production facilities ...... be it grass root plant or be it modernization or expansion.

A number of administrative and governmental constraints have been observed but today, our subject stresses on the Indian chemical industry and I would therefore observe on those characteristics of constraints which refer to the Industry's own work. Suffice it to say that timely work can be achieved only by aggressive management who are committed to meeting schedules at any cost.

* payments to be done on time
* placing of orders on time, and
* building up the industry's own team of adequate specialists

are the need of the hour.

Here, I would like to make an universal observation that per week, there are nearly 400 tender notices in the media and nearly 2000 to 10,000 inquires sent out in this industry in our Western Region alone. I have yet to come across a single public notice of a tender or an inquiry for a purchase where though the last date of submitting the tender is very clearly pronounced, there is no date mentioned ever by the buyer as to when he will commit to placing the order!

So, here is a glaring lack of commitment, as I can see, on the part of the buyer when he expects the seller to commit. Here I may also make mention of large houses of machinery suppliers, fabricators and system engineered product suppliers in India who are also unable to make an offer in a comparable period as these groups are also not adequately organized to make bids on time. Here, also both the sellers and the buyers who serve this industry need to tune up their own operations for achieving speed.

(C) Specific Budget & Cost Control Objectives

The problem of undertaking the project within a specific budget and implementing a cost control to achieve the schedule is remarkably absent. Of late, due to the high cost of money, it is the financial institutions who are extending loan facilities and other instruments to reduce the cost burden on the industry.

In the course of our experience in the last three decades, we have come across a few multinational organizations who undertake meticulous definitive cost studies of the plant before embarking on the actual implementation and this alone has resulted in not only cost control but adherence to specific budgets and therefore, automatically less burden of interest, complete absence of delayed payments and all round improvement in quality and satisfaction both to the seller and the buyer of plants.

I urge this group who are keen for globalization, to undertake such in-depth, definitive cost studies and utilize well known methods of project management, project implementation, procurement, inspection in an orderly manner with a committed target to be met with at any cost.

It is our experience that such costs are insignificant when compared to the delay on project implementation and project funds tied up in idle, incomplete plants.

(D) Quality & Efficiency of the Product

The quality and efficiency of a plant is no doubt based on what you put in it and therefore, plants have to be bought at a specific threshold price and not just unworkable prices which ultimately result in a total absence of quality and efficiency of performance of a product during the plant operations.

While this subject is not new to the industry in general, its implementation is tardy and needs a committed management for committed results and for committed quality of end products which will serve the global market with success.

In addition, special aspects which are no doubt having additional significance for globalized activity can be enumerated below :-

i) Environment Protection and Pollution Control. This aspect of the industry is now gaining importance and even though certain portions of the industry are considering this as a necessary evil .... here, I may like to mention the various European organizations which are now explaining that when they buy products from India particularly the chemical industry products, the industry has to certify that their products are made in plants which conform to international pollution control standards and they protect the environment.

In effect several enlightened world buyers of products don't wish to export pollution while buying products from Asia. Thus, it is important today that the plants you build will protect the environment and similarly it is important for the service industry also to see that the environment also protects the plant against corrosion etc.

ii) Safety has become an important aspect of plants particularly in view of tremendously complex chemicals and hazardous products which are a part of the production scenario.

Safety of personnel, safety of plant equipment and safety of transportation systems are an integral part of any plant which serve the global needs. One of the aspects of safety is that safety does avoid accidents and hence ensures predictable programmes of production and hence are an important necessity for global business success.

iii) Expansion of Plants will be a part of the Indian scenario of the chemical industry when these industries will gear up for serving global markets. Likewise modernization will also be a feature which cannot escape the trend towards globalization of the Indian industries.

Both these activities somehow are industry-related to existing plants — old or new. Smaller plants are to be made into larger plants and systems, control systems, pollution control equipment and on-line analysis and inspection are to be introduced.

These functions of expansion and modernization therefore are in a way more challenging than even setting up of a grass root plant.

And, therefore at this stage it is important to bring to the attention of our chemical industry the very nature of this challenge. The entire process of expansion and modernization are extremely complex from all points of view and these should not be under-estimated.

iv) Production of chemicals is one aspect of globalization; however, this is a suitable occasion to indicate the critical need for packaging, storing and transportation of bulk products as well as packed products for servicing the global market.

Here again, technology and experience has brought in ingenious new developments, new methods and new technologies. These need to be adopted without any hesitation.

What can the Chemical Industry Do?

a) The chemical industry is well advised to organize their own in-house teams of specialists. Production specialists, maintenance specialists and technology adaptation groups for setting up of plants and facilities successfully. Though India has a large source of technically qualified manpower, the experience has to be an important element of successful operation of plants and here again training is an essential part of a successful team to run plants for the chemical industry.

b) Search, identification and negotiations for important additive technology and fresh process subjects and also process control industries, process control systems need to be effectively implemented. Special mention is made for the need to respect intellectual property rights for this inevitable trend towards globalization.

c) The chemical industry can do well to make definite estimates for their capital investment and for their cost of production and suitably effective methods to buy services, equipment and to construct the plants on time are needed.

d) The chemical industry must accept automation as a part of all round improvement in product quality, efficiency and quantity. And therefore, this aspect of plant design .... be it batch operation ..... or be it continuous operation ..... be it small ..... or be it large .... is gaining serious significance.

Of special interest to the chemical industries, I wish to recommend that a trend should be encouraged for;

* Turnkey plants, or
* B.O.T. plants, or
* Leasing plants & systems

in order that the chemical industry achieves rapid growth and sophistication.

What can the Service Industry Do?

The service industry can serve the chemical industry in a number of ways :

a) A spirit of working together with the industry instead of working for the industry can bring in tremendous synergy. Resources constraints — both with the industry and with the service groups — are evident; at same time the task is enormous and hence, the spirit of cooperation and working together will form a win-win situation.

b) There are a number of special expertise and services that may not be available in India but these have to be brought to India but the Indian service involvement and the involvement of the chemical industry problems should be complete and hence, I plead with the service industry groups present here to participate in this venture-some activity of modernization of proccess engineering, plant engineering and so forth.

c) Facility planning activity currently has reached a high level of sophistication in the world ..... particularly from the point of view of reliability and dependability of plant systems. This requires not only team work but also adherence to the principles of ISO 9000.

   In our exercise for qualifying for ISO 9000, we have come across one single salient feature which is likely to be the most successful element for achieving ISO 9000 for any service industry in India. This feature depicts substantial deficiency in the decision-making process of all managers and above.

So, it is upto us in the service industry to organize ourselves in such a way that **Deficiencies are reduced and elimi-**

nated and as many of our organizations serving the chemical industry globalization, can achieve ISO 9000 status.

It is important to note that once you achieve ISO 9000 status, one has to maintain it as long as one exists by persistent continuous efforts.

As globalization brings larger and larger projects with more complexities, budgets are larger and the service components are also are larger in some instances, service groups may have to offer nearly a half a million man-hours for a project — say in period of 24 to 30 months. Besides several aspects of,

* system design
* turnkey work, etc.

will require organizations to build up a larger capital base to service the investment needed for;

* personnel and training
* space
* telecommunications and
* computerization and
* project control.

Many of our service industries have a capital base and this can also be a major challenge which will have to be met from within and with other additional resources from the financial institutions and mutual funds and venture capital groups.

International participation in this potential and globalization process could be equally welcome!

I would like to end this paper by expressing the hope that **the process of globalization will bring forth a renewed cooperation between the chemical industry and the technical services groups.**

Globalisation of Indian Petrochemical Industry — Challenges and Opportunities

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Introduction

It is better to understand and define more precisely what we mean by GLOBALISATION and that too globalisation of industry, especially Indian industry, with a special reference to a petrochemical Industry. Then only we can explore this topic further and more meaningfully. Globalisation of business, trade, certain cultural and social values, sciences and even political systems are possible and have happened also to a varying degree.

Globalisation in various areas

We are aware of the globalisation of science. Science has gone global in the last few decades and all countries and communities have accepted the global character of science. Economy is almost getting globalised. Almost all communities and countries have accepted the principle of unavoidable interlinks and complex networking of the international trade balances, To a greater extent, the west has been able to globalise the material value systems and to some extent the east has been able to globalise the spiritual value of the system. Even the political systems are globalised if we go by the recent events in India and the second world. In fact with a stroke of the political pen, the concept of the second world has been wiped out and the third world has lost its meaning. But globalisation of industry — what does it really mean?

TECHNOLOGIES being extensions of EXACT SCIENCES and the industry being an entity for organised practice of these technologies, we are not very wrong in expecting certain globalisation of technologies and industry on the lines of sciences, values and politics and business.

Backlash due to Globalisation of Industry

Something interesting and seemingly contradictory is happening at local levels. Industry has become the main bone of contention for more localisation and regionalisation. Though it is getting a global character, industry is strengthening the local and regional forces. This is possibly because of the growing technocentric nature of the today's society being at logger-heads with the desperate attempt by the same society to preserve its local culture, economy and ecology; against this background we must view the globalisation of Indian industry.

The Generic Character Matrix

In order to clearly understand the meaning and implications of the term globalisation, we must be able to characterize the gamut of the industrial activities under certain common generic characteristics. These will form a multidimensional matrix which we may call as the generic character matrix of the particular industry. Major general characteristics are resources, people, skills and knowledge base, conversion processes, products, standards and codes, social/economic/cultural impacts, environmental impacts etc. Whenever we talk of globalisation of Indian industry, it is in the understanding of this multi-dimensional generic character matrix that our success or the failure will rest.

Two Faces of Globalisation

There are two ways of looking at the globalisation of Indian industry especially the petroleum and petrochemical industry using the above mentioned matrix. One is the inward globalisation i.e. how global is our industry in the characteristics acquired from import of some of the aspects and dimensions of the matrix.

The other is the outward globalisation i.e. how global is our Industry in generic character matrix to be able to function effectively in alien lands. I would like to divide my talk into two sessions viz. inward and outward globalisation as I feel that both are equally important.

Inward Globalisation of Indian Industry

Most of the technologies working in Indian Industry are imported. Not only are the technologies imported but also all other characteristics in the general matrix are imported to a very high degree. These are truly globalised because these come from all kinds of countries from all over the world. Only perhaps the people and the impacts are not imported. Starting from refineries and steel plants from erstwhile USSR, we have a gamut of operating technologies from Japan to Canada and from US to Italy. What then are the challenges and opportunities in Inward Globalisation of Indian industry?

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Challenges and Opportunities in inward Globalisation

The formost challenge in my opinion is the optimal management of resources technology and products in a variety of areas of Indian industry. We have to create a truly distributed but interconneted dynamic information data base for the multi-dimensional generic matrices for various types of industries. This will help us in continually assess, assimilate and adopt incoming resources, conversion processes, products knowledge bases and skills, standards and codes all these to our advantage. This will provide us unlimited opportunities to globalise inwardly and outwardly.

Taking the areas petroleum and petrochemicals specifically, this will mean the following

- Feedstock sourcing,
- characterisation and
- management

By historic evaluation, typically Indian gas/oil producers and refineries dictate the feedstock quality and quantity. Since the petrochemical industry has low priority when compared to fertilizer and energy sectors and since it consumes only about 5% of the total hydrocarbons processed, it has also been at the receiving end. Acquiring the ability to import/use available feedstock appropriately and at the appropriate time, understanding the quality and quantity implications, acquiring the ability to continually scan international market actively and, buy, rather than passively accept, what is dished out , are challenges in this area. That is what feedstock management is all about in the Indian petrochemical industry.

To give an example, typically IPCL handles about 50 feed quality changes per year (though not as optimally as I would like to think) and even in a gas cracker about 10 quality changes in a year in C1 and other trace impurities. There are tremendous opportunities to intelligently source and buy feedstock for the petrochemical industry in a globalisation situation.

There are other challenges and opportunities in the Indian gas and oil sector. Some of the these are better estimation of recoverable resources, better secondary and tertiary recovery methods based on globalised know-how, skills and technologies. New polymeric materials have come in the market for pipeline transportation and distribution.

Exciting challenges and innovative opportunities exist in the globalised situation if we remove our mind-set on crude import. Possibilities of importing " Bottom of the barrel" or heavier ends and processing these through deep catalytic cracking (DCC) from China or hydro-demetallisation/hydrocracking or coprocessing with low grade crude for more lighter and middle distillates from Canada are worth consideration. We can even plan a grass-root petrochemical refinery based on this concept and partly reduce crude import to better advantage. Integration from production through refining to petrochemicals by creating innovative business structures and systems is also an opportunity and challenge.

But the biggest challenge in this area lies in methane chemistry (C1 chemistry) to make hydrocarbons and using coal as feedstock for petrochemical industry. With changed geopolitical scenario and as an active globalisation strategy, we must be able to tap advanced technologies from South Africa, Canada, and China for meeting this challenge.

The ultimate challenge is in reducing imports and effective use of available resources with minimum change to our environment. This is where the technology management comes into picture.

Monomer technology and use pattern management

Petrochemical monomers are normally produced using thermal cracking, reforming and separation technology. Though traditionally for ethylene reforming and propylene as well as the major aromatics in the C6/C7/C8 range of monomers, of late these are being slowly elbowed out by a growing family of monomers, such as C4, novel styrenics, C9/C10 aromatics, alpha olefins, C5 monomers and other olefins, diolefins and acetylenes. In fact nitrogen, sulphur and oxygen containing monomers are increasingly gaining importance in speciality chemicals and polymer areas. We have to globalise our efforts in this area of Indian petrochemicals both inwardly and outwardly as captive Indian markets alone will not be able to justify our efforts in short and medium range and we will miss one of the most important opportunities if we enter this area now.

Apart from the mature Fischer-Tropsch route monomers, related technologies like SASOL and C1 conversions are the current opportunities. Methane to methanol to monomers and middle distillates is another promising area of activity in near future. Another related area is oxygenates which will be discussed later.

An important and related area is the monomer purification area. With increasingly stringent specification on monomer quality, novel processes like adsorptive separation, novel extraction, super controlled and sequenced hydrogenation are being practiced. These are necessary to be masterminded if we want to globalise the monomer quality.

It is not enough any longer to only concentrate on the technology of producion of monomers. We have to concentrate

on the pattern management of production of monomers including mass inter-complex and inter-plant movement of monomers as well as the storage of these on lean use periods. This is a real challenge facing Indian petrochemical industry today and we have to evolve a game-plan. Ethylene grid networking through contagious complexes as in the west and the large mounted tanker movements with flexible and comprehensive terminal facilities will have to be created. There are opportunities for translational movements of monomers also. In fact Reliance has already pioneered this concept in India. We should expand this concept. Lean period storage and booster storage areas in which IPCL has taken a lead at MGCC for C2/C3/C4 are areas where the engineering and safety challenges are considerable.

Product Performance and Pattern Management

The products from petrochemical industry can be broadly classified as bulk polymers, surfactants, petrochemicals, fibre intermediates and speciality chemicals and polymers. These are traditional classifications which perhaps were applicable to all till 80's. But today the industry produces products of specific performance and is in search of product labels. This is not mere product management in the traditional marketing jargon but really use-pattern, performance management. This calls for a reorientation of marketing to technical performance marketing. This is clearly a challenge which globalisation of petrochemical products have brought about. Another increasingly growing concern that has been added to the performance marketing is its environmental performance in terms of degradability, impact and life cycle that has given rise to a brand new world of recyclable polymers and materials, biocompatible and biodegradable materials, polymer blends, alloys and composites with other synthetic and natural substances, post-polymerisation modifications etc.

A few newer products that have come in recent years are the gasohol formulations; lead replacing oxygenates like MTBE/ETBE/TAME which are manufactured in the same plant with almost same set of equipment. The novel process of catalytic distillation for this has a universality about it in that it is elegant and globally adaptable. High temperature polymers, special engineering polymers like PC, PPO, PPS and their blends and alloys as well as speciality chemicals like alcohols, ethoxylates and condensates are but a few opportunities that are coming to our notice.

It is important to clearly define the need rather than merely promote the want of society or the community that we will serve in our efforts to globalise. Packing use pattern is going to undergo a sea-change in Germany according to a recent news item. Germany is going to pass a law under which people will be allowed to unwrap packaged item in the super markets to reduce polymer waste generation, which is threatening the ecology of German towns. And here in India we are talking about expansion of 15 to 20 % in polymer packaging use. That is why we must attempt to derive the need rather than promote a want. Want markets are never stable and are whimisical. Globalising Indian industries cannot afford stable markets to begin with until all the main needs of the consumer society are satisfied.

Evolving National Standards and Codes

National standards and codes are equivalent to the cultural/social norms or value system of a society in an industry at national level. These are evolved with maturing in industrial activity. No amount of supplanting, as has been done in our country haphazardly, can lead to national standards and codes that will be voluntarily accepted and promoted instead of being enforced. The nearer it is evolving towards international standards, the more opportunities we shall have for going global outwardly. In this connection it is important to mention about current developments in the globalisation of quality related parameters by evolution of the generic series of ISO 9000 international standards. These are rights steps in the right time for India.

Even for inward globalisation we need to have national industry standards and codes on such aspects as utilities, safety, materials, process, raw materials, products, environment, health and toxicity etc. An interesting case is that of IPCL which had globalised its Baroda complex so much that at certain point of time we had no less than 27 levels of steam all over the complex instead of the normal three as per the norms in Indian industry. This is but a tip of the confusion that can result if we do not evolve national standards and codes before talking of globalisations. Another case in point is the arbitrary nature of central excise and custom values. The challenge before us here is to evolve a set of viable and enforceable rules and convince the Government to enforce these through appropriately created or reconstituted authorities.

Yet another related area is the equipment manufacturing and servicing companies. In the petrochemical industry in India the mechanical fabrication facilities cater to almost 80% of equipment needs. But it is in the case of valves, fittings, pumps and accessories and the whole field of instrumentation and process control that we are not having national codes and standards. Another area of growing concern is the applications software area in Indian industry. If these can be brought under control, we can globalise much faster without missing current opportunities.

Challenges and Opportunities in outward Globalisation

We have considered aspects of the generic standard matrix in inward globalisation. All of them apply for outward glo-

balisation also. Hence there is no need to discuss them again. Over and above these I would like to articulate loudly certain thought processes that come when I look at the topic under dicsussion.

I am coming to the point of "backlash" that we discussed in the earlier part of the presentation. Many developed countries have attempted to outwardly globalise their opportunities in the past. But they have met with limited success only. It goes without saying that obviously the guest country should have the necessary flexibility and adaptability to globalise it's industry.

Fortunately in the area of petrochemicals this last mentioned criteria for globalisation is abundantly available. This makes the Indian petrochemicals industry an eminently suitable candidate for globalisation from this important point of view.

The challenge here is different. It is developing the ability to negotiate and strike not a hard but a balanced bargain. We must be able to evolve a team of super-negotiators who can do this job with the complete understanding and appreciation of the host country's generic character matrix for that technology.

The role of highly developed and respected consultancy organization will be invaluable in expanding opportunities and meeting these challenges. The other strategy is to help in developing skills and knowledge base in the host country. IPCL has made a beginning in these areas in establishing three groups namely the PDS (Petrochemicals Data Service), PMDI (Petrochemicals Management Development Institute) and PII (Petroleum India International), the last being a joint venture of several public sector companies in the oil industry.

Another important challenge is the evaluation of such globalisation ventures with developing countries in areas such as Africa, South America, South Asia, South East Asia and the erstwhile Eastern bloc. We have to have an alternative basis that truly restricts the real need of the venture between the two countries rather than dollar currency gains on investment and trade due to the joint venture.

I believe that most of the globalisation efforts in petrochemical industry will be driven by feedstock availability in host country in the near future. Another area will be absorbant and catalyst related process in petrochemical industry especially in the area of aromatics. The opportunities can be explored in the traditional targets in the Middle East. It can be Africa and South East Asia because of geo-political compatibilities. This means that the Indian petrochemical industry is to make certain attempts to understand the generic characteristics of these potential host countries. One of the ways to do this is to have a partner like Singaore for east and Zimbabwe for Africa. Additionally we can station industry representatives attached to the Indian embassies of potential host country for a specific period of time.

Research and Development sourcing and technology management

It is estimated that by the turn of the century that the total investment in petrochemical industry will be to the tune of Rs. 30,000 crores. The in-house R&D centres attached to this industry have a major role to play in the outward globalisation. Appropriate strategies have to be evolved for the development of technologies in frontier areas so that we can avoid repeated import of technologies from a few multinational owners who always try to use our country as a second-hand technology sink.

It is necessary to increase the component of the R&D led business in the overall turnover of the industry. Technology sales centres with adequate infrastructural facilities and trained human resources are to be created in order to achieve globalization both inwardly and outwardly. The modernization of R&D and pilot plant facilities are expected to pay rich dividends in this endeavour.

The issue of protection of intellectual property rights is a serious matter from the globalisation point of view especially because we are dealing with frontier areas. Our knowledge of globalised intellectual property generation, maintenance and transfers are not adequate even for yesterday's world. We probably have one of the best patenting system in the world when one views the whole issue of protection of intellectual property. An aggressive patenting system both national and international has to be evolved to hasten the process of globalisation.

Conclusions

We have explored the topic of globalisation of Indian industry with special reference to Indian petrochemical industry. We have tried to define and divide the topic into two parts namely inward globalisation and outward globalisation. We have tried to examine the basis of using a generic character matrix to guide us to arrive at opportunities. We have seen and discussed specific challenges and opportunities in the area of petrochemical industry.

Our ultimate success in globalisation will depend on learning from the mistakes of other globalising nations and from our previous experiences. Unless we take care of the local differentials we can not integrate globally.

The IPCC Scientific Assessment of Climate Change

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The Intergovernmental Panel on Climate Change (IPCC) is a body composed of government delegates which was set up in 1988 jointly by two UN agencies: the World Meteorological Organisation and the UN Environment Programme. The object of IPCC was, and still is, to act in a scientific and technical advisory capacity to support discussions on international conventions on climate change.

IPCC decided that assessments in three areas were needed: the science of climate change; impacts; and policy responses. It set up three working groups under the chairmanship of the UK, USSR and USA to do this. IPCC asked Working Group 1 to prepare an assessment which was as up-to-date as possible, including our best estimate of how climate may change in the future, together with an estimate of our uncertainties.

The member nations of the WG met in January 1988 and agreed upon the scope of the assessment, and its preparation would be entrusted to a number of lead authors, who would in turn involve a larger number of contributors through the mechanism of international workshops for each of the sections of the report. The lead authors met in March 1989 to define their task more closely and agree to a timetable. Many of the section contributors held short preliminary meetings in May 1989, and the latter half of 1989 was taken up by a parallel process for each of the sections: first drafts, followed by workshops to refine and agree on a second draft.

The drafts were combined into the first draft of the full report in February 1990 and modified at a week-long meeting of all lead authors in Edinburgh. This was then sent out to a large number of peer reviewers, and their comments were considered by the lead authors in preparing the final draft of the report. This was agreed at the second meeting of WG1 national representatives in Windsor in May 1990, together with a 30-page summary aimed at policymakers (hence termed the Policymakers Summary) which had been through the same peer-review process.

The final report was delivered to IPCC in June 1990. In order to make the report widely available in the public domain, the Cambridge University Press was asked to publish it, and this was available from September 1990. The peer-review process was an important part of the report preparation. The second draft was sent to scientists nominated by national delegates to IPCC (who circulated it further to other scientists), to the members of the Joint Steering Committee of the World Climate Research Programme, the Scientific Advisory Committee of the International Geosphere-Biosphere Programme and the Committee for Climate Change and the Oceans and, in addition, to about 20 other scientists. The large number of reviews undoubtedly led to considerable improvements in the final draft. The 1990 report is therefore a comprehensive, authoritative and internationally accepted assessment of current understanding of climate and climate change. The main conclusions of this

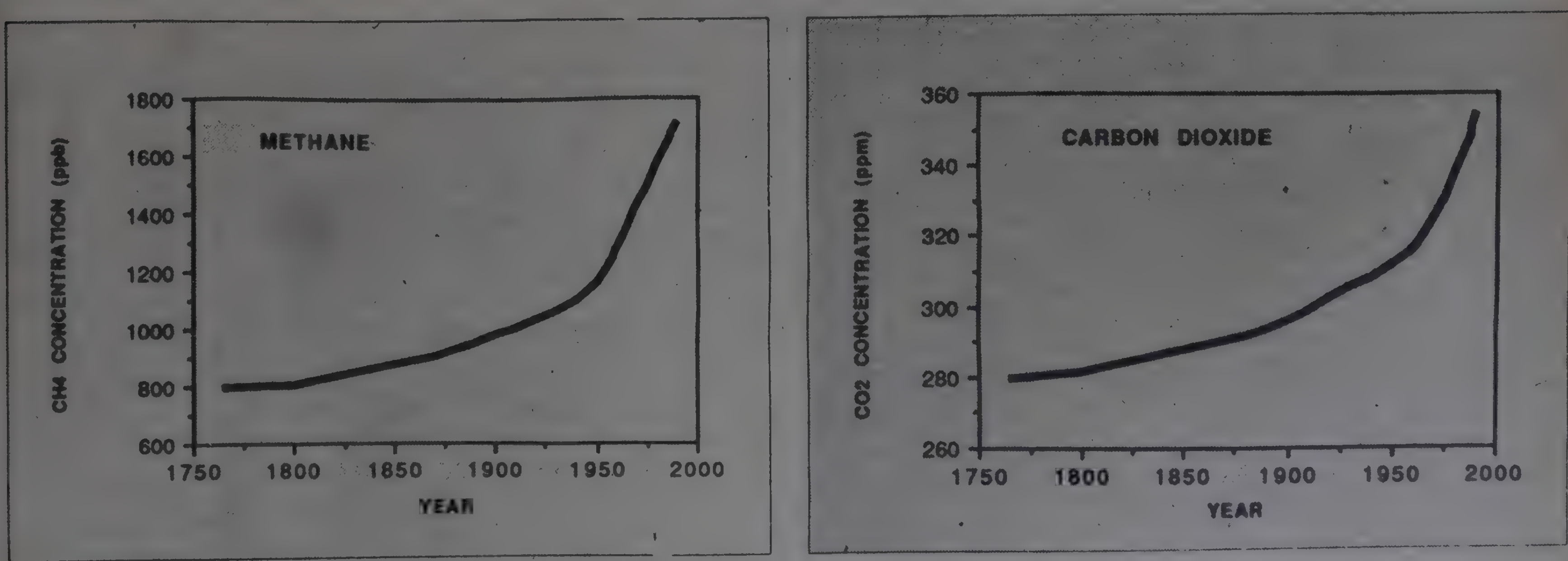

Figure 1: Changes in greenhouse gas concentrations due to human activities

report are summarised in this presentation. Firstly, the greenhouse effect as a physical mechanism is real. There is no doubt that increases in the concentration of greenhouse gases will warm the earth — we know this from satellite measurements, from planetary temperatures and from the close association that exists between temperature and greenhouse gas concentrations in ice cores.

We know that greenhouse gas concentrations have increased substantially due to human activity (Figure 1) and will continue to do so. We also know that many of the greenhouse gases have very long lifetimes or adjustment times in the atmosphere. CO_2 has a number of sinks, so its lifetime cannot be given a single number, but is in the range of 50 to 200 years.

This also means that current concentrations are out of balance with emissions; even if emissions of CO_2 were stabilised at today's levels, concentrations would carry on rising at 50 per cent of today's emission rate, concentrations would rise less quickly, and even with no further human-made emissions, concentrations would fall only slowly (Figure 2). As a further illustration of the atmospheric response to emissions, WG1 calculated that to stabilise concentrations would require cuts of 70-90 per cent in long-lived gases, and about 20 per cent in methane. WG1 also used projections of future man-made "Business-as-Usual" emissions (provided by Working Group 3) to further estimate future atmospheric concentrations.

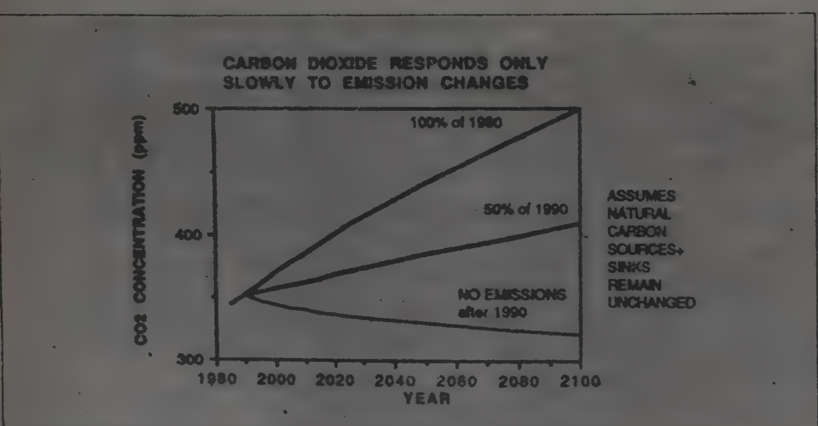

Figure 2: The effect on CO_2 concentration of immediate changes in human emissions

None of these calculations take into account possible feedbacks from climate change into natural cycles of CO_2 and methane. The report identified many possible feedbacks which would influence concentrations of the gases through disruption to the natural cycles. There are great uncertainties in their magnitude and the group chose not to try to quantify these; however, it opined that it seemed more likely that they were overall positive rather than negative, that is, that greenhouse gas concentrations will be further enhanced by natural feedbacks.

Radiative forcing

The next stage of the climate prediction process is to relate atmospheric concentrations to radiative forcing. This then enables us to calculate the increase in radiative forcing due to increases in the greenhouse gases during the decade of the 1980s'; it is seen (Figure 3) that CO_2 represents half of the total change. The contribution from ozone could be significant but is too uncertain to quantify in exact terms.

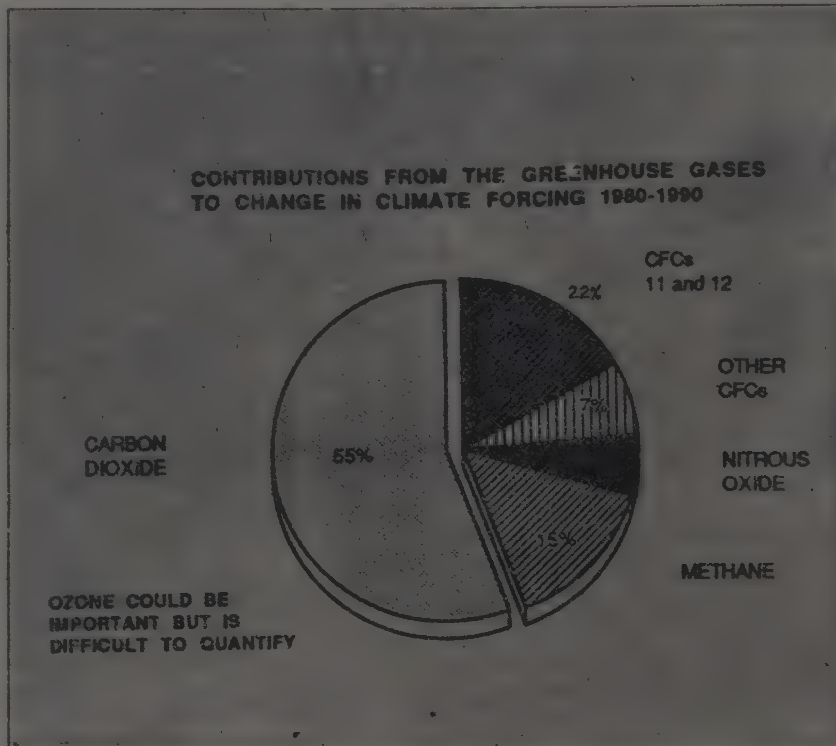

Figure 3: Contributions of the greenhouse gases to climate forcing over the last decade

From a knowledge of their radiative properties and lifetimes, the relative climate effect of equal emissions of each gas was calculated over a given time horizon — the so-called Global Warming Potential of each gas. This shows that over the next 100 years, taking CO_2 as unity, methane has a GWP of about 30, N_2O about 300 and the CFCs several thousand (Figure 4).

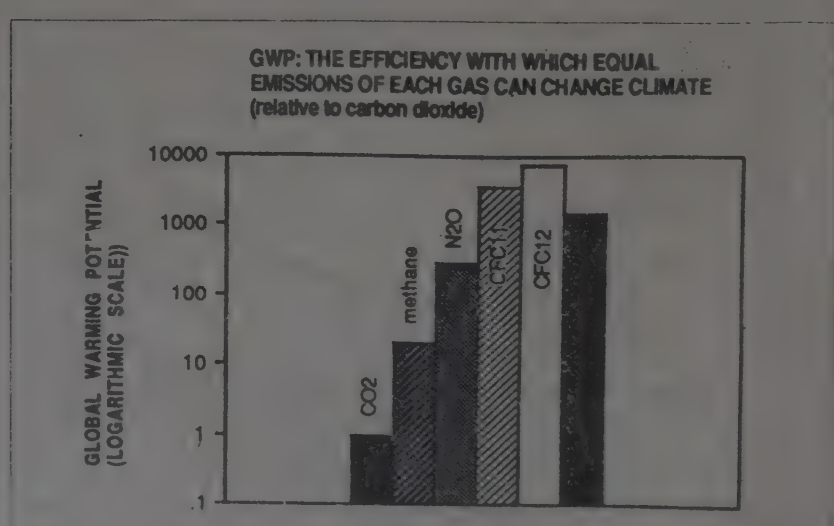

Figure 4: Global warming potentials

This concept in turn allows the relative climate effect over the next 100 years from 1990 emissions to be estimated. It is expected that, even more than in the past, CO_2 will dominate the increases in climate forcing (Figure 5).

Climate change—equilibrium and transient

The next stage is to look at the actual climate changes arising from the increased radiative forcing. To start with, WG1 examined the results from "equilibrium models" where the atmospheric concentration of CO_2 is doubled and the climate system allowed to come to a steady state. The report finds some indication that the newer, high-resolution models are better at simulating present day climate, and hence might be expected to be better ar predicting change. The general features of climate change which are common to most models and for which we have physical explanations are catalogued. The group decided that there was no reason to change the value of the 2 x CO_2 climate sensitivity from the range of 1.5-4.5°C which has been accepted for some time.

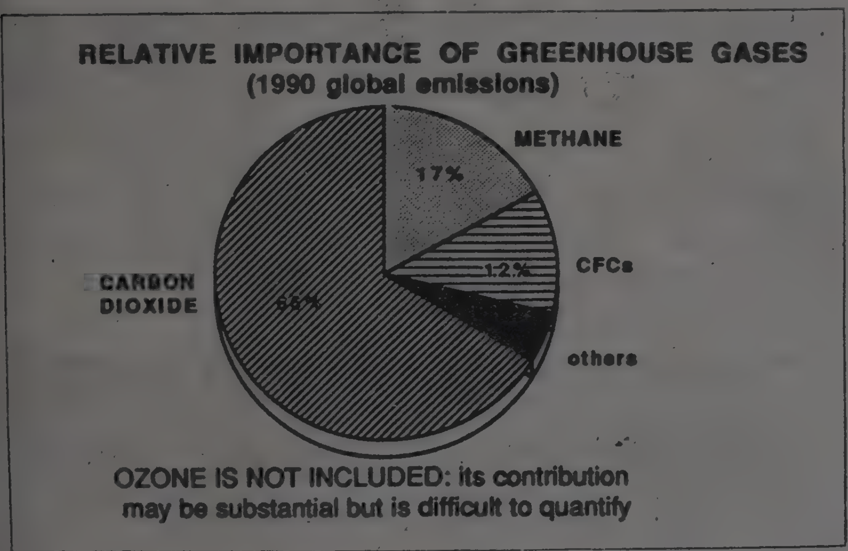

Figure 5: Contributions of the greenhouse gases to climate forcing over the next 100 years

The report then considered the real world case of slowly changing forcing (as greenhouse gas concentrations slowly increase) and a climate system which is affected by the slow response of oceans. The projection of radiative forcing developed earlier was input to a box-diffusion upwelling energy balance model, and the best estimates of parameters such as ocean heat diffusion and climate sensitivity were used. The model output of global mean temperature increase by the year 2100 is shown in Figure 6. The report also looked at results from the first real tran-sient climate integration using a coupled ocean atmosphere model, that of Manabe et al at GFDL, Princeton. At a time of doubling of CO_2 in the transient run, the temperature rise is substantially less than the equilibrium case due to the delaying effect of the ocean. The ratio of this is typically 70 per cent, but there are two areas where very little warming occurs, in regions where there is deep-water convection which acts as a "heat sink" and prevents temperature rising.

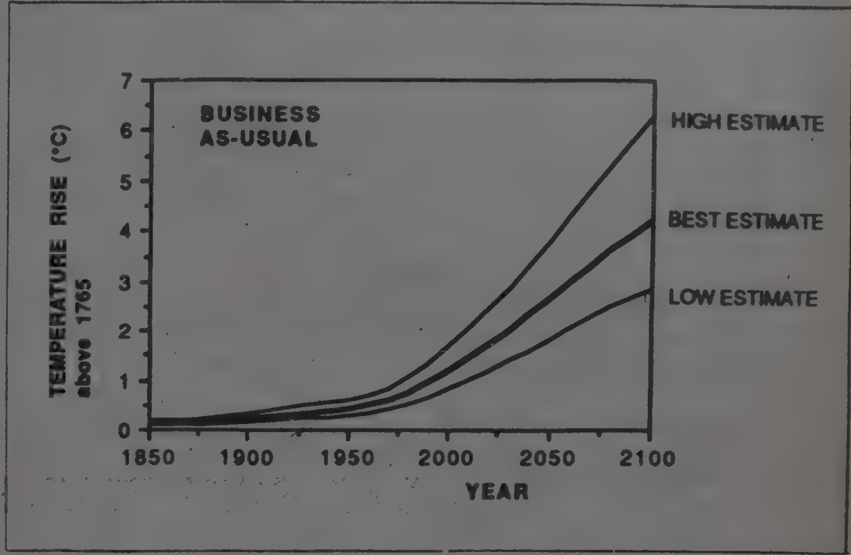

Figure 6: Model predictions of global mean temperature rise

The conclusions from these transient integrations are that temperature will rise by 0.3°C/decade (range 0.2-0.5) on a Business-as-Usual acenario, that oceans will warm more slowly than land surfaces, and that large areas of the northern Atlantic and Antartic Oceans will hardly ever change.

Turning now to observations, the report concludes that global mean temperatures have shown great variability over the last 100 years, but have risen by about 0.3°C-0.6°C. The rise has not been steady in time or space. The two hemispheres have behaved quite differently, with a steadier rise in the SH and a short cooling period in the NH. The spatial pattern of temperature rise shows enormous variability at local scales, and this will surely be a feature of any future temperature rise.

Has the climate already changed due to man's activities? The evidence does not provide a clear answer. Considering global temperatures alone, the "best fit" is with the low end of model simulations (Figure 7), but the comparison is complicated by natural climate variability, that is, that which occurs without external forcing. This variability is deduced from models to be about 0.3°C on a decadal timescale and, thus, could account for almost all of the observed increase seen. Alternatively, this natural variability and other factors could have offset a larger warming than has been observations. The unequivocal deduction of the man-made greenhouse effect from simple temperature observations is not likely for a decade or more, but the use of more sophisticated "finger-printing" techniques could bring this forward.

Other climate indicators show some change: sea level has risen by about 10 cm over the last 100 years; glaciers have

retreated on a global basis over the same period. However, there has been little change in sea-ice extent.

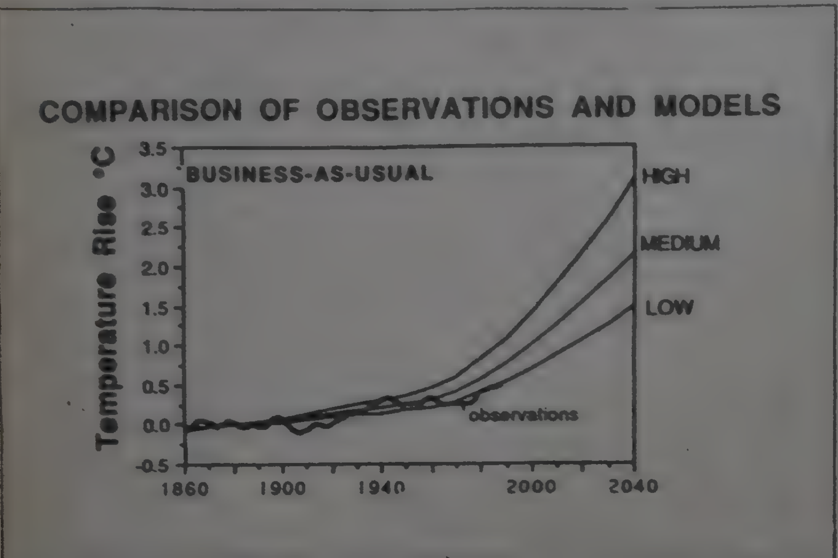

Figure 7: Comparison of model predictions and observations

How much do we expect the sea level to rise? Figure 8 shows predictions from the best models currently available, based again on Business-as-Usual emissions; a rate of rise of 6 cm per decade is seen (with a range of uncertainty of 3-10 cm/decade). By the end of the next century, rises of between 30 cm and 110 cm are indicated. The rise will not be uniform over the globe. It is expected to be due largely to thermal expansion of the ocean and melting of small glaciers. The net effect of the Antarctic and Greenland ice sheets may be small, but they make a major contribution to the uncertainty. Within the next century, it is not likely that there will be a major outflow of ice from the West Antarctic Ice Sheet due directly to global warming.

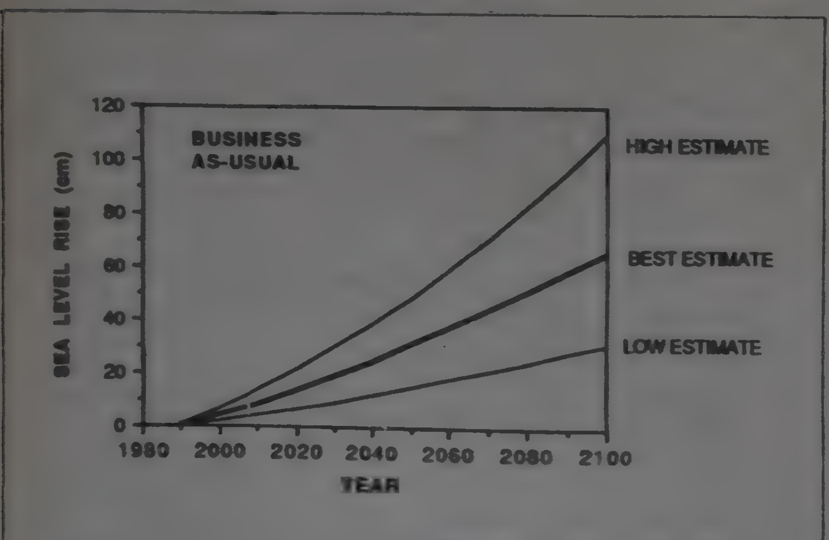

Figure 8: Predictions of sea level rise

Uncertainties

All of the predictions are subject to great uncertainty due to our incomplete understanding of the climate system. The key areas of uncertainty are the following:

* clouds, change in which can have a large influence on the climate sensitivity;

* oceans, which control the rate of climate change;

* natural greenhouse gas cycles, which could change to amplify or reduce the man-made influence;

* polar ice sheets, which affect predictions of sea level rise.

Many large international programmes, under WCRP and IGBP, are planned which will address these uncertainties. Because these processes are at least partly understood, we are quite confident that the uncertainties can be reduced by further intensive research.

Further assessment

Because the pace of scientific research into climate change is accelerating, IPCC asked Working Group 1 to prepare a short update to the 1990 Science Assessment by early 1992, before the UNCED Conference in Rio de Janeiro. This work began in late 1990 and is now of compilation, in its final stages.

From the viewpoint of the policy-maker, three factors stand out as most important. Firstly, that scientists have demonstrated that the potential exists for considerable human-made climate change. Secondly, our predictive uncertainties are large, so we cannot rule out any climate surprises. The "ozone hole" is a painful remainder of how little we understand our atmosphere. Thirdly, the long (100 years) lifetime of CO_2 and some other greenhouse gases means that any slowing down of their present rate of increase will be difficult, and emissions reductions made earlier will be more effective than those initiated at a later date.

News From Japan

RELEASED FIGURES INDICATE CHEMICAL INDUSTRY IS STILL IN GOOD SHAPE

While a recessionary trend appears to be sweeping across many Japanese manufacturing industries, the chemical industry maintains high levels of production and shipments, absorbing the attention of many concerned. According to a prompt report from MITI, the mining and manufacturing production trend in February showed a 0.6% drop from the preceding month, but that of the chemical industry, excluding the pharmaceutical one, recorded a 2.7% rise.

This stemmed, the MITI report says, from high-level production of photo films and cosmetics in addition to heavy production of petrochemicals including ethylene, polyethylene and polypropylene. Although a recessionary feeling is spreading throughout the industry and many chemical firms are likely to register substantial profit drops in the current business year ending in March, the industry itself can be regarded as being in a good state as far as the figures for production and shipments are concerned.

The nation's mining and manufacturing production trend suffered drops for three months in a row from December thru February, and this trend is projected to continue in March and April.

In contrast, the indexes for the chemical industry scored gains in January and February, though last December saw a drop. Indexes for February production and shipments showed gains of 2.7 and 3.5%, respectively. In addition, February inventories recorded a 0.1% decline, really indicating a good business state.

A MITI survey on the major chemical manufacturers' projections' for production in March and April shows the March index registering a 4.2% decline but the April one recording a 3.4% gain, offering a sharp contrast with a projection for industry in general showing a 0.6% fall. Commenting on this, a MITI official concedes: "I am unable to explain this well." Is the chemical industry still thriving alone?

MANDATORY SPECIFICATION OF HARMFUL CHEMICALS TO GO INTO FORCE

In an attempt to prevent labor accidents triggered by chemical substances, Japan's Ministry of Labor is scheduled to inaugurate next April a system for specifying their harmfulness. This step complies with the issuance in 1990 of ILO's treaty No. 170 referring to the safe use of chemical substances in workshops.

Under the planned system, chemical producers will be obliged to deliver material safety data sheets (MSDSs) to users, attach to containers labels denoting information about the harmfulness of the specified chemical substances and put the names of harmless materials upon their containers.

User companies of chemical substances will be, for their own part, urged to hold MSDSs so that workers can refer to them, educate workers with regard to safety/sanitation by making the most of the MSDSs and take measures for preventing industrial accidents.

The following 10 items will be recorded on each MSDS — the name of the chemical substance, the name and address of the company who prepared the MSDS itself, the ingredients of the chemical substance and their volumes, classification of the harmfulness concerned, emergency measures against accidents, instructions for handling, the physical/chemical properties of the chemical substance, information about its harmfulness, related legal regulations and the date of the preparation of the MSDS. The harmfulness to be specified by the MSDS will be classified as: explosion, high-pressure gas, flammability, combustibility, spontaneous ignitability, intense reaction with water, oxidation, self-reactivity, acute toxicity, corrosiveness, carcinogenicity or mutagenicity.

The harmfulness of the chemical substances will be checked according to the national standards to be established this June by the Ministry of Labor.

MITSUBISHI PETROCHEMICAL IDLES 25,000-T/Y ACRYLIC ACID PLANT

Mitsubishi Petrochemical Co. mothballed a 25,000-t/y acrylic-acid plant at its Yokkaichi factory at the beginning of April and will not start up the plant again for at least three months to cope with the slackening supply-and-demand situation. The cutback is equivalent to nearly 25% of the firm's acrylic-acid capacity.

Domestic demand for acrylic acid and acrylic acid ester had been growing at the annual rate of 7-8% on average until around the middle of 1991 for use in pressure-sensitive and ordinary adhesives, paints and water-absorbing resin. But the market situation has been easing increasingly since then, mirroring the ending of demand growth in the latter half as well as capacity expansion.

The firm expanded acrylic-acid capacity in the middle of last year to 110,000 t/y but has reduced its production to some extent in recent months. Mitsubishi Petrochemical is one of major Japanese acrylic-acid makers: Nippon Shokubai Co. is the largest-capacity maker with 150,000 t/y.

Japanese acrylic-acid shipments in 1990 totaled about 225,000 tons, comprising 155,000 tons for the domestic market and 70,000 tons for export: the nation's acrylic-acid capacity stands at about 370,000 t/y and acrylic-acid-ester capacity, 310,000 t/y.

Idemitsu Petrochemical Co. plans to advance into the acrylic-acid field around this summer with a 50,000-t/y plant. In the Western markets, acrylic-acid demand has also tended to turn downward.

TOMEN BUYS CHEVRON'S OVERSEAS BUSINESS RIGHTS FOR PESTICIDES

Tomen Corp. has bought from Chevron Chemical Co. (U.S.) overseas business rights for the U.S. firm's three major agrochemicals — "Orthene" pesticide for tobacco and vegetables, "Monitor" pesticide for tobacco and vegetables, "Monitor" pesticides for cotton and potatoes and "Select" herbicide for broad-leaf crops: the two pesticides are based on organic phosphorous compounds.

The rights — valid for the whole world excluding the States —include development/marketing rights, ownership of toxicity data needed for registration agro chemical production patents, trade-mark rights and registration in each country. Tomen envisages exploiting markets in China, East Europe and CIS, in all of which the Chevron products have yet to be marketed on a full scale.

It aims to push their sales to ¥10 billion ($75 million) within five years by making the most of over 80 agrochemical distributors affiliated with the U.S. company. In addition, Tomen also plans to promote overseas sales of Japanese-made agrochemicals on the strength of marketing channels thereby formed abroad.

Orthene has already been marketed by Tomen in Japan under the "Ortoran" trade name. It will be continuously supplied by Chevron Chemical but Monitor and Select will be produced by other companies on a commission basis. Tomen has been allowed to supply the latter two to Valent — U.S. subsidiary of Sumitomo Chemical Co.

MITSUBISHI PETROCHEMICAL TO UP CAPACITY FOR SPECIALTY EPOXY MATERIAL

Mitsubishi Petrochemical Co. is considering boosting capacity for 2,6 xylenol dimer, an epoxy-resin material whose demand has been on the rise in Japan. This reflects the firm's plan to reinforce its phenol-related business operations. The company is now operating a 400-t/y plant for the material and will elaborate the expansion plan within the year. It may raise the capacity to 1,000 t/y.

2,6-Xylenol dimer is used for manufacturing specialty epoxy resin mainly for encapsulating agents. The agents made by using the dimer have good electrical characteristics and phy-sical properties suitable for sophisticated electronic parts. The 400-t/y plant at the Yokkaichi factory has been running at a high operating rate reflecting bullish demand.

The additional plant of multipurpose type is expected to start regular operation in 1994 or 1995. To expand phenol downstream areas, the firm set up in February an equally owned joint venture in Japan with Schenectady Chemicals, Inc. of the U.S. The new firm will import a variety of monoalkyl phenols from the States and plans to build a 12,000-t/y plant for paratertiary butyl phenol and octyl phenol on the site of Mitsubishi Petrochemical's Kashima factory. Mitsubishi Petrochemical sees it as being vital for expansion of its chemical operations to strengthen phenol and its derivative areas. The firm thus also plans to construct a plant for 2,6-xylenol in connection with its dimer production.

MPC'S KASHIMA EOG PLANT DUE ONSTREAM LATE IN JUNE

It has been revealed that the ethylene oxide (EO) and ethylene glycol (EG) production facilities Mitsubishi Petrochemical Company (MPC) has been constructing at its Kashima Plant, will be completed in May and will go into operation late in June. The annual production capacity of the new facilities is 180,000 tons (based on EO). On the occasion of the starting of operation of the facilities, the operation of the existing facilities (annual production capacity: 80,000 tons) will be suspended, for the expansion of production capacity by the scrap-and-build formula.

The establishment of the new facilities is a part of the Kashima 2nd-term plan centered on the facilities for production of 300,000 t/y of ethylene. Originally it was planned to build facilities for the annual production of 110,000 tons (in terms of EO). Later, however, it was decided that it was necessary to secure cost competitiveness by means of the merit of scale, at a time when stabilised medium-term demand can be expected. For improving production efficiency, a new catalyst has been adopted for the new facilities. Mitsubishi Petrochemical's gross production capacity will increase to about 260,000 tons.

The production of EG as a polyester material is increasing on a stabilised basis. Last year EG output in Japan was about 500,000 tons. In the field of film, profits are decreasing due to escalating competition in magnetic tape. However, the filament market continues its growth on a firm basis. EO as a whole is showing stagnation due mainly to the inactive demand for antifreeze. So efforts will be focused hereafter on the use of EG for filament.

Mitsubishi Petrochemical will exert great efforts for the expansion of exports to the Southeast Asian market, for which expansion it has been unable to spare much effort. The reason is that the demand for polyester fiber is increasing in Southeast Asia, along with the economic growth of this area. Mitsubishi Petrochemical has also started a joint enterprise for EOG production in

Singapore. Because the facilities concerned are being operated to the full, the company wants to support the development of markets by relying on exports from Japan.

JAPANESE OIL DISTRIBUTORS TO RUSH INTO MTBE-MIXED GAS

Japanese oil refiners-distributors will rush into the marketing of MTBE (methyl tertiary butyl ether)-mixed premium gas, motivated by the good sales of such gas Kyodo Oil has enjoyed since late last year.

Cosmo Oil Co. will start sales of MTBE-mixed gas in May, and Nippon Oil Co., Idemitsu Kosan Co. and Kyushu Oil Co., plan to join the race in the fall of this year. Mitsubishi Oil Co., on the other hand, intends to market premium gas mixed with a new additive other than MTBE, while Esso Sekiyu K.K., Mobile Sekiyu K.K. and Kignus Sekiyu K.K., etc., are taking a wait-and-see attitude.

Kyodo Oil's high-octane gas has enjoyed very good sales since its market launch last year. It is rare in Japan for a new-type high-octane gas to be in strong demand. The Japanese high-octane-gas market will thus be supplied with two types of products — an MTBE-mixed one by Japanese oil distributors and a high-octane one without MTBR mainly by foreign-capital affiliates. High-octane gas accounts for about 15% of the Japanese market with demand in the last one year rising by over 20% over the year-before level, while growth of regular-type-gas demand here has been on a downtrend, recording minus growth last January.

NORIT TO PUSH ADVANCE INTO JAPAN ACTIVE CARBON MARKET

Norit N.V. of the Netherlands, the world's top supplier of active carbon, will step up its thrust into the Japanese active-carbon market via its wholly owned subsidiary — Norit Japan. The firm intends to expand its lineup of products by imports from the parent firm and enhance marketing activities here, as Norit's new plant (10,000 t/y) in Texas, the U.S. is likely to enter operation in June.

The company plans to introduce bituminous coal-source active carbon by the summer and boost sample shipments of mineral charcoal-source active carbon for use in auto-use canisters. Norit auto-use active carbon has been put through tests by major Japanese car makers and has gained good responses from them. The Dutch firm is determined to cultivate the Japanese market for the product in a serious way. Established in 1982, Norit Japan has been supplying powder, pellet and granular charcoal to the Japanese market. Norit N.V. has four production bases in the Netherlands, the U.K. and the U.S. with their combined capacity exceeding 100,000 t/y. It will put into operation in June a bituminous coal-source granular-charcoal plant (10,000 t/y) in Texas and plans to start operating a 3,000-t/y plant for mineral charcoal-based active carbon for car-use canisters in the U.K. within this year.

HOECHST JAPAN TRYING TO UP AGROCHEMICAL SHARE TO 6%

Hoechst Japan Ltd., a Japanese subsidiary of Hoechst A.G. of Germany, intends to boost by 1997 the share of its agrochemicals in the Japanese market from the current 2% level to the 6% level which the Hoechst group holds in the agrochemical market worldwide. Hoechst Japan's share is likely to reach 3% by the end of this year.

The firm has been pushing agrochemical business here satisfactorily after marketing its "Basta" non-selective herbicide. It recently expanded its lineup of herbicides by introducing "Hayabusa" herbicide, containing the same effective ingredient (glufosinate ammonium) as "Basta". The company also plans to apply for registration next year of two new chemicals — "Silatop" paddy-use insecticide and "Afugan" fungicide. Adding them, the firm hopes to achieve a 6% share by 1987.

The Hoechst group chalked up annual sales of about ¥220 billion, ranking at the bottom of the list of the world's top-10 agrochemical makers. The supplies of its agrochemicals to Japan, however, have been limited. It seems that Hoechst is now attaching importance to the Japanese market, now the second largest in the world.

"Hayabusa" is a low-priced version of "Basta" but features prompt effects and enhanced safety, offering options to users. The company expects that the two chemicals will command about a 10% share combined of the Japanese herbicide market in the next three years.

CHINA'S POLYOLEFIN IMPORTS TOP 1,000,000 TONS IN 1991

Chinese demand for polyolefin and other petrochemical products is expanding at an accelerating pace, reflecting implementation of her reform/open-door policies and the resultant economic growth in special economic zones spreading along her coasts.

Chinese imports of polyethylene and polypropylene in 1991 came to 650, and 560,000 t/y, respectively, almost double the preceding year's results in both cases. They boosted combined polyolefin imports to 1.21 million tons. Polystyrene imports in the year rose from 250,000 to 390,000 t/y. Polyethylene and polypropylene imports in the October-December, 1991 period amounted to 300,000 and 210,000 t/y, respectively, showing a 3-fold upsurge over the corresponding term of the preceding year. They accounted for nearly half their total imports for the whole of the year.

China's ethylene production in 1991 is put at 1.5-2.0 million t/y. The product was in tight supply in response to rapid expansion of domestic ethylene demand, thus raising China's olefin imports by a large margin. Since the turn of the year 100,000 tons of polyolefin have been imported every month from S. Korea which is hurting from serious oversupply of petrochemical products.

China's imports of polyethylene and polypropylne from Japan in 1991 stood at 75,000 t/y (39,000 t/y for LDPE; 36,000 t/y for HDPE) and 48,000 t/y, respectively: they exceeded the preceding year's levels by large margins. The shares of the Japanese products in China's combined imports of each item reached 12 and 8%, respectively. The Chinese economy in 1991 attained 7% growth (6% gain for 1990) with her trade surplus in the year and foreign exchange reserves at the end of last September reaching $8,100 and 40,000 million, respectively.

250,000-T/Y GWM PLANT COMPLETED IN CHINA

As a joint venture between Japan and China, JGC Corporation has completed a 250,000-t/y CWM (coal water mixture) plant in Shandong Province and a first lot of about 4,000 tons of CWM was delivered to Japan March 24. The product is to be fed to a new boiler of Tayca Corporation — a titanium-dioxide manufacturer.

Four companies including JGC Corporation and Nissho Iwai established a joint venture in Japan last March to supply CWM mainly to users of boilers for private power generation and completed a 10,000-kl storage facility as a 1st-phase program. CWM is a new liquid fuel with pulverised coal and water mixed at the rate of 7:3 and additive added in ultrasmall volumes. It is expected to be utilised as a substitute for petroleum or powdered coal, besides fuel for boilers, and as raw material for coal gasification, and coal chemistry.

SUMITOMO CORP. ENGINEERING PLASTIC FIRM FORMED IN GERMANY

Sumitomo Corp. has established Summit Speciality Polymer GmbH (SSP) in Germany for marketing engineering plastics in the EC. This is aimed at coping with market expansion and diversifying needs for engineering plastics following the unification of the EC set to be completed by the end of this year.

SSP will also be a center in the EC for the trader's engineering-plastic businesses which have so far been undertaken separately by Sumitomo Corp. branch offices in European countries. By starting the new firm and improving its information-collection system, the giant trader intends to push annual sales of such plastics in the EC to ¥5 billion ($38 million) in three years.

New Developments from Japan

BACTERIA SAID TO BE HIGHLY CAPABLE OF DEGRADING NYLON MEMBRANE

Kobe Steel, Ltd., has confirmed that lignin-decomposing bacteria (wood-decaying microorganisms) — which the company has discovered by itself —are capable of degrading nylon to a high degree. Nylon has hitherto been regarded biologically undecomposable. Researchers at the leading Japanese steel maker inserted nine types of microorganisms including the said bacteria (IZU-154 strains) into nylon-66 membranes, which are often used as filter material.

The resultant products were placed on agar media and the microorganisms concerned were cultured for 20 days at a temperature of 20°C. The research has proved that the IZU-154 strains were the most effective, reducing the molecular weight concerned from 85,000 to 5,500. They have also confirmed that the membrane was decomposed to the highest degree when either the nitrogen or carbon content in the agar media or both of them were lowered to a certain level.

The nylon membrane was, they claim, decomposed through (biological) oxidation as in the case where nylon is degraded by applying heat and light thereupon. The research results are expected to pave the way for wrestling with environmental problems related to undegradable high polymers.

Director Y. Takahara of Biological Research Institute attached to Kobe Steel says: "We have yet to confirm whether the bacteria are useful for the decomposition of other forms of nylon — nylon fiber and film. We intend to apply them to the treatment of these nylon products and other materials including polyethylene".

The IZU-154 strains are capable of decomposing more than 80 per cent of lignin — the main ingredient of wood. The company is also trying to apply them to paper/pulp production. It has to date been known that microorganisms belonging to the Flavobacterium class are capable of decomposing water-soluble nylon (molecular weight: less than 2,000) to a certain degree.

JOINT VENTURE FOR CELLULOSE-BASED BIOPOLYMER FORMED BY SIX FIRMS

Ajinmoto Corp. and five other private businesses have jointly established in Tokyo Biopolymer Research staffed with a total of 24 researchers. The joint firm is scheduled to conduct six years of research on basic technology for producing biopolymer from cellulose produced by microorganisms.

The targeted technology will be based on the biological cellulose production proces already pioneered by Ajinomoto. The company aims to utilise the biopolymer as industrial material as a final target. Biological cellulose is obtained by putting acetic-acid bacteria in culture media, thereby causing fermentation.

The product has good potential to be processed into sheet and added to paper, serving as excellent functional material in both cases.

When transformed into sheet, the product is expected to have rigidity more than 10 times that of ordinary paper and rival thin aluminium sheet in terms of strength. Its potential applications are high-quality regenerated paper, food material and medical supplies, etc. It is believed to be easily decomposed by soil bacteria.

The joint venture is mainly aimed at breeding cell strains capable of efficiently producing cellulose, developing continuous culture equipment and elucidating the properties and structure of the biological cellulose.

BUSINESS TIE-UP FOR BIOLOGICAL DEODORIZER UNDER WAY

Denka Consultant & Engineering Co., and NGK Insulators have tied up for business operations involving a biological deodorizing system, in which polyvinyl-alcohol (PVA) gel carriers (diameter: 10mm) coated with active carbon are used for efficiently decomposing hydrogen sulfide, mercaptan and other substance emitting offensive odor.

The carrier's water-retaining ratio is as high as 50 per cent, so microorganisms are believed to propagate on the carrier's surface or within the carrier itself. NGK Insulators has decided to employ the system for sewage-treatment facilities, which the company has contracted to build for the Osaka prefectural government.

The firm aims to spread use of the system for public wastewater-treatment facilities and Denka Consultant intends to apply it to the disposal of industrial wastewater and treatment of industrial flue gas. The latter is in charge of carrier production.

MITI TO STIMULATE DEVELOPMENT OF NEWER SYNTHETIC FIBER PRODUCTS

The Ministry of International Trade and Industry (MITI) will support R&D efforts for new synthetic-fiber products to be applied to environmental protection and the welfare field. Demand for such products is expected to grow substantially in Japan.

The fiber products in question cover marine structure free from rust and seaweed, sheets to be used in civil engineering and construction to protect the environment from industrial waste, and apparel and equipment used for nursing the sick aged who are expected to grow with the greying of society. Back of this is the recognition that Japanese synthetic fiber-made clothing

will confront growing competition more and more from equivalents from developing countries and has no rosy prospects for future development, so that Japan's fiber industry should create newer products with a competitive edge in the nonapparel area. As for marine structures, MITI will undertake application tests together with major construction companies on the basis of a 2-year-long survey MITI has conducted.

For civil-engineering sheets, MITI will start this fiscal year standardising products developed for such purposes to encourage commercialisation. MITI will also help three major synthetic fiber makers — Toray, Teijin and Asahi Medical — commercially develop apparel and devices specially designed for nursing the aged.

NEW LOW-SWEET SACCHARIDE STABLE AND EASY TO USE

Hayashibara Biochemical Laboratories, Inc. has discovered a new-type saccharide — glucosyl lactoside (GL) — and has also succeeded in producing neotrehalose, a kind of sugar, utilising GL. Neotrehalose was known to be present but has never been commercialised. The glucosyl lactoside is a nonreducing trisaccharide comprising lactose and glucose which features a low level of sweetness (about one-fourth that of sugar) and easy use (good crystallisation). A nonreducing saccharide is not affected by aminoacids and other nutrients when mixed with them.

Neotrehalose produced from GL is a disaccharide featuring nonreduction, a low level of sweetness (about one-third that of sugar) and good crystallisation as well. Hayashibara says that its GL was made from lactose and α-cyclodextrin as starting material but it is also possible to produce GL by means of enzymatic reaction between lactose and low-priced starch. The firm will hurry to establish the mass-production technology for the new saccharides.

The company says it will continue research on the acid resistance and heat resistance of GL. It suggests that GL is suitable for use in foodstuffs and that neotrehalose may be suitable for use in medicines in addition to food products.

PS FOAM TO BE RECYCLED AS POLYMER ALLOY

Hyogo Prefectural Institute of Industrial Research is scheduled to wrestle with three years of research on recycling of foamed polystyrene (PS). The institute aims to blend used PS foam and various types of polymer with the help of compatibilisers including surfactants and thereby produce PS-based polymer alloy, which is superior to regenerated PS foam in terms of workability and shock resistance.

It envisages making up for deterioration in the physical properties of regenerated PS pellets by changing them into polymer alloy, thus exploiting new application fields for recycled PS foam.

When foamed PS trays are recycled with conventional methods, molecules included therein are partly broken by the heat applied and the strength of the resultant products declines by approximately 10 per cent. Applications of recycled PS foam have to date been limited to flower pots, etc.

If used PS foam can be successfully transformed into polymer alloy, it will be able to replace PVC in electric-cable and pipe applications. At the request of the Hyogo prefectural government, consumer groups and supermarkets in Hyogo Prefecture began last year to recover foamed PS trays and, along with this, Expandable Polystyrene Industry Association has set up a recycling center in Shingu, Hyogo Prefecture.

MARKET INFORMATION

Citric acid eases, other prices steady

Prices remained stable in the Bombay Market for the week under review. Citric acid eased to Rs. 50 per 50 kg. Arrivals of imported materials also pushed down the prices of Gohsenol GH-17 and potassium carbonate. In the solvents section ortho xylene went up by Rs. 5.50 to Rs. 31 per kg.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on May 19, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.00
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	5.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	102.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	5.00
Borax (Granular)	35.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	85.00
Butyl carbitol	110.00
Caustic soda (Flakes)	18.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	5,000.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	180.00

Hydro	58.00
Hyflosupercell	42.00
Hexamine (Resale)	32.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	47.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	200.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	40.00
Phthalic anhydride (Resale)	41.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	80.00
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	70.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	115+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	16.50
Acetic Anhydride (Resale)	34.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	65.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.00
Benzo trichloride	16.00
Benzoyl chloride	22.00
Bromine Liquid	115.00
Chloroform	65.00
Carbon Tetrachloride	27.00
Cellosolve	70.00
Cyclohexanone	80.00
Cyclohexanol	85+ST
Diacetone (Resale)	29.00
Diethyl Oxalate	34.00
Diethyl glycol (DEG) (Resale)	48.00
Dioctyl Phthalate	69.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	24.00
Ethyl Acrylate	92.00
Ethylene Dichloride	21.00
Ethylene Glycol	32.00
Formic Acid (Imp.)	34.00
Formaldehyde (Resale)	7.75
Glycerine (CP)	70.00
Glycerine (IW)	65.00
Hydrogen Peroxide 50% (Resale)	45.00
Isopropyl Alcohol	42.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	115.00
Melamine	62.00
Methyl Ethyl Ketone	60.00
Methyl Isobutyl Ketone	60.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	30.00

Carbitol	115.00+ST
Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	66.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	18.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.50
Xylene (Ortho)	31.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	92.00
Alpha Naphthol (Imp.)	230.00
Aceto Acetic Ester (Methyl)	140.00
Acetanilide	62.00
Anthraquinone	135.00
Anthranilic Acid	115.00
2-Amino 4-Nitrophenol	160.00
Blue B Base (Local)	330.00
Beta Naphthol	75.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid (IDI)	650.00
BON Acid	130.00
CPC (Crude)	115.00
Chicago Acid (Atul)	350.00
Coach Acid	68.00
Cyanuric Chloride (German)	265.00
DEMAP	275.00
2.4-DNCB	35.00
Dichlone (Imp.)	450.00
Dimethyl Aniline	85.00
Diethyl Aniline	145.00
Diethyl Sulphate (Japan)	93.00
Diethyl Sulphate (Local)	80.00
Diamino stilbene disulphonic acid	210.00
3,3-DCB	260.00
Diphenylamine (U.K.)	155.00
Gamma Acid (Atul)	225.00
Gamma Acid (Local)	175.00
H. Acid (Atul)	160.00
G. Salt	82.00
J. Acid	375.00
J. Acid Urea	450.00
K. Acid	125.00
MPDS (Local)	155.00
MNA	130.00
Meta Ureido Aniline	190.00
MPD (Local)	175.00
MPD (German)	210.00
N-Methyl J. Acid	515.00
N-Methyl Aniline	125.00
Naphthalene (Refined)	31.50
Ortho Anisidine (OA) (Imp.)	108.00
Ortho Dichloro Benzene (ODCB)	22.00
OT Base	170.00
OT Liquid	75.00
Para Dichloro Benzene (PDCB)	40.00
Para Anisidine (PA local)	160.00
PNA	95.00
Para Cresidine (Imp.)	330.00
Para Amino Azo Benzene (India)	135.00
PNCB (HOC)	50.00
Para Nitro Toluene	85.00
1-Phenyl 3-Methyl 5-Pyrazolone	175.00
Phenyl J. Acid	415.00
PT Base	165.00
Rhoduline Acid	600.00
Resist Salt 80%	26.00
Resorcinol	350.00
Sodium Naphthionate	85.00
5-Sulpho-Anthranilic Acid	115.00
Sulphanilic Acid	35.00
Sulpho Tobias Acid	155.00
Tobias Acid (Imp.)	115.00
Metanilic Acid	48.00
MTD (German)	185.00
Vinyl Sulphone	125.00

Bombay Drugs Market

(Prices as on May 19, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	600
Aluminium Hydroxide IP	43
Ampicillin Sodium	4400
Ampicillin Trihydrate	3250
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2800
Analgin	330
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1450
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium Lactate	30
Calcium D Pantothenate	1550
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2950
Chlorpropamide	240
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3200
Cimetidine	3350
Citric Acid IP	100
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	2000
Diclofenac Sodium	2400
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	365
Disodium Hydrogen Citrate	110
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2700
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	800
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	125
Hydroxylamine HCl	600
Hydroxylamine Sulphate	108
Ibuprofen IP	470
Imipramine HCl	5000
Indomethazine	1100
I.N.H.	375
Inositol IP	1400
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	110
Lactic Acid (Japan)	165
Levamisole	2000
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	170
L. Lysine Pharma Grade	270
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	315
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	325
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	525
Metronidazole Benzoate	500
Morpholine	180
Neomycine Sulphate	4400
Niacin	300
Niacinamide	385
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4700
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	150
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	225
Piperazine Hexahydrate	180
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2100
Pyroxicam	3100
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	250
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	850
Sulphacetamide Sodium	380

Product	Rs./kg.
Sulphadoxine	2900
Sulphamethoxazole	390
Sulphasomidine	475
Sulphaphenazole	325
Terbutaline Sulphate	30000
Tinidazole	480
Theophylline Anhydrous	415
Thiacetazone	325
Thoridazine HCl	20000
Thycol (Potassium Gluconate Sulphate)	500
Tolbutamide	225
Trifluopromazine HCl	11000
Trifluoperazine HCl	12500
Trimethoprim IP	1875
Tween 80	275
Vitamin B6 Hydrochloride	3000
Vitamin B2 5-Phosphate	4500
Vitamin K-3 (Water soluble)	750

DRUGS INTERMEDIATES

Product	Rs./kg
1-Amino-4-Methyl Piperazine	1400
2-Aminopyridine	575
Beta Picoline	230
2-Chloro Propionic Acid	50
2-Chloro Propionic Chloride	80
3-Chloro 4-Fluoro Aniline	1500
2:4-Dichloro Benzoic Acid	550
2,6-Dichloro Aniline	775
3,4-Diamino Benzophenone	470
Diethyl Malonate	95
Diethyl Oxalate	45
Dimethyl Acetamide	175
Dimethyl Amino Ethyl Chloride HCl	220
Dimethyl Dichloro Silane	195
Dimethyl Sulphoxide	170
Furoic Acid	165
Isobutyl Benzene	190
Lasamide	875
2,6-Lutidine	1750
1-Methyl 1-Amino Methyl Thio 2-Nitro Ethane	1550
2-Methyl 5 Nitro Imidazole	180
Methyl Acetoacetic Ester	160
Methyl Chloro Formate	100
Methyl Isothiocyanate	400
Nitromethane	200
N-Butyl Diethyl Malonate	170
N-Methyl Piperazine	850
Ortho Nitro Benzaldehyde	1400
Para Chloro Benzoic Acid	190
Para Hydroxy Acetophenone	800
Para Hydroxy Phenyl Acetamide	1800
Pivaloyl Chloride	410
Propionic Anhydride	[illegible]

Bombay Dyes Market

(Prices as on May 19, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: MAY 15 (NNS) An easy-to-firm tendency was noticed in the local chemicals market during the the week under review. On good offerings of citric acid China and Bombay Dyeing coupled with lack of follow up support from local as well as outside buyers, citric acid, slided down by Rs. 450/750 at Rs. 4,900/5,300 per 50 kg. Discouraging advices from Bombay further subdued the market sentiment. Due to slack support coupled with offerings by the stockists, borax granular suffered a loss of Rs. 25 at Rs. 1,700 per 50 kg. Following pressure of offerings, paraffin wax was down by Rs. 50 at Rs. 1,075 per 50 kg.

In the absence of demand, match wax nosedived by Rs. 1,000 at Rs. 17,000 per tonne while on emergence of renewed buying support, residue wax shot up to Rs. 8,300 from Rs. 7,600 per tonne and slacke wax remained firm at Rs. 12,500 per tonne. For want of support, chatkolite slipped by Rs. 2 at Rs. 74, and safolite lost Rs. one at Rs. 80 per kg. However, Rangolite Germany remained firm at Rs. 120 due to paucity of ready stock. Due to slack support from sugar industries, caustic soda flakes slumped by Rs. 15 at Rs. 825/835 per 50 kg. Tartaric acid France remained firm at its last week closing of Rs. 506 despite slack support from cheese manufacturers. Following restricted supplies coupled with paucity of ready stock mercury jumped by Rs. 400 at Rs. 7,800 per flask. In the absence of offerings titanium dioxide TTP marked up by Rs. 6 at Rs. 71 per kg. Similarly RC-822 titanium improved by Rs. 2 at Rs. 96 per kg. On better buying enquiries from Pakistan and Afghanistan, menthol bold showed a gain of Rs. 5 at Rs. 265 per kg. and menthol flake also improved by Rs. 2 at Rs. 236 per kg. Menthol medium quality was quoted at Rs. 252 per kg. and menthol oil at Rs. 162 per kg. DMO remained firm at its previous closing of Rs. 65 per kg.

Ammonia bicarb, soda bicarb and soda ash prices remained stable at their last week closing. Despite poor offtake, most of the dyes and colour maintained their last week closing.

(DELHI MARKET RATES AS ON MAY 15, 1992)

Ammonia Bicarb (Per 25 Kg.)	178.00
Mercury (Per flask)	7,800.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	825/835.00
Citric acid (Per 50 Kg.)	4,900/5,300.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCI (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	415/425.00
Sod. Hydrosulphite (Per Kg.)	55.00/64.50
Rangolite (Per Kg.)	120.00
Safolite (Per Kg.)	80.00
Chatkolite (Per Kg.)	74.00
Decolite (Per Kg.)	120.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,900.00
Paraffin Wax (Per 50 Kg.)	1,075.00
Slack wax (Per metric tonne)	12,500.00
Tartaric Acid (France Per Kg.)	506.00
Borax Granular (Per 50 Kg.)	1,700.00
Borax Crystal (Per 50 Kg.)	1,950.00
Sodium Nitrite (Per 50 Kg.)	725/800.00
Sodium Nitrate (Per 50 Kg.)	525.00
Camphor Thal (Per Kg.)	140.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	265.00
Menthol Medium (Per Kg.)	252.00
Menthol Flake (Per Kg.)	236.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	162.00
Glycerine (Per Kg.)	65.00/70,00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.00
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	43.50/44.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (50 Kg.)	625/630.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	71.00
Titanium Dioxide RC-822 (Per Kg.)	96.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	N.A.
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	57.00/67.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	31.75/32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,200
Match Wax	17,000.00
Residue Wax	8,300.00
Decolite	96.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T.	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

Normalcy has returned to the trade and prices are steady without much variation. Prices maintained old levels and trading is picking up slowly. Problems on account of stock market shake up are there but it is much less visible in chemicals market when compared to other markets. The long shut down of NOCIL plant has reduced the availability of products like IPA, NBA, DAP, MIBK etc. but presence of imported stock has checked the prices from going up.

(MADRAS MARKET RATES AS ON MAY 16, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.50
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	42.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per 50 kgs)	325.00
Borax (per kg)	32.00
Boric Acid (per kg)	64.00
Calcium Chloride Solid (per kg)	4.00
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	8.00
Calcium Carbonate (Precipitated) (per kg)	7.00
Caustic Soda Flakes (per kg)	18.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	38.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.00
Ferrous Sulphate Crystal (per kg)	5.50
Hydros (TCPL) (per kg)	57.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	44.00
Hyflosupercell (per kg)	48.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	42.00
Magnesium Carbonate (per kg)	28.00
Magnesium Chloride (per kg)	4.50
Magnesium Sulphate (per kg)	3.50
Mercury (per 34.5 kgs)	8,000.00
Nickel Chloride (per kg)	200.00
Nickel Sulphate (per kg)	210.00
Phosphoric Acid (per kg)	35.00
Potassium Carbonate (per kg)	30.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	520.00
Soda Ash (TATA) (per 75 kgs)	520.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	10.00
Sodium Sulphite (per kg)	14.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	5.50
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	27.00
Trisodium Phosphate (per kg)	14.00
Titanium Dioxide (Anatase) (per kg)	66.00
Titanium Dioxide (Rutile) (per kg)	98.00
Zinc Chloride (per kg)	22.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	14.50

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	36.00
Acetic Acid (per kg)	22.00
Acid Slurry (per kg)	37.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	120.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	67.00
Glue Flakes (per kg)	18.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	350.00
Oxalic Acid (per kg)	18.00
Pentaerythritol (per kg)	66.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	215.00
Phthalic Anhydride (per kg)	44.00
Sodium Acetate (per kg)	15.00
Sodium Alginate (per kg)	275.00
Sorbitol (per kg)	27.00
Urea (Technical) (per kg)	4.00

SOLVENTS

Acetone -- HOCL (per kg)	33.00
Benzene (per litre)	22.50
Butanol (per kg)	55.00
Butyl Acetate (per kg)	60.00
Carbon Tetra Chloride (per kg)	30.00
Cellosolve (per kg)	80.00
Chloroform (per kg)	35.00
Diacetone Alcohol (per kg)	45.00
Diethylene Glycol (per kg)	42.00
Di-butyl Phthalate (per kg)	66.00
Di-octyl Phthalate (per kg)	70.00
Ethyl Acetate (per kg)	27.00
Isopropyl Alcohol (per kg)	44.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	28.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	54.00
Octanol (per kg)	80.00
PEG 400 (per kg)	76.00
Perchloroethylene (per kg)	40.00
Propylene Glycol (per kg)	67.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	37.00
Toluene (per kg)	24.00
Xylene (per kg)	30.00

CALCUTTA MARKET (Prices as on May 17, 1992)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	2,750.00
Camphor (per kg)	92-94.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	800.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	285.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

EXHIBITIONS & CONFERENCES

AMERICAS

Bio-Recognition/Bio-Reconnaissance International Industrial Biotechnology Conference. June 1-9, Montreal, Canada. Contact: Hazel Strouts, Industry, Science and Technology, Canada. Tel: 613 954 3021; Fax: 613 952 4209.

Chemical Manufacturers Association Annual Meeting, June 3-5, Greenbrier, WV, USA. Contact Tel: 202 887 110; Fax: 202 887 1237.

HazMat, the Hazardous Materials and Environmental Management Conference & Exhibition/International, June 10-12, Atlantic City, NY, USA. Contact Tel: 708 469 3373; Fax: 708 469 7477.

Eco World ' 92 conference on the environment sponsored by the American Society of Mechanical Engineers, June 14-17, Washington, USA. Contact: Cynthia Phon, Eco World News Bureau, Tel: 212 593 6400.

Northeast University/Industry Technology Transfer Conference, June 16-17, Philadelphia, USA. Contact: Tel: 615 366 0679; Fax: 615 366 0695.

The Independent Liquid Terminals Association's 12th Annual Operating Conference and Trade Show, June 22-23, Houston, USA. Contact: Tel: 202 659 2301; Fax: 202 466 4166.

World Chemical Congress, Sep. 13-16, Newport Beach, CA, USA. Contact: Tel: 718 876 8800; Fax: 718 720 4666.

Seminar on Advances in Polyurethane Foam Formulation, October 5-6, 1992, Sheraton Colony Square Hotel, Atlanta, GA, USA. Contact: Technomic Publishing Co. Inc., 851, New Holland Avenue, Box 3535, Lankaster, Pennsylvania 17604, USA. Tel: 717 291 5609; Fax: 717 295 4538; Telex: 230-753565.

Sixth Annual seminar on Biostability of Polyurethanes, October 13-14, 1992, Sheraton Boston Hotel & Towers, Boston, MA. Contact: Technomic Publishing Co. at the address given above.

Seminar on **Polymer Foam Morphology,** October 26-27, 1992, Souffer Harborplace Hotel, Baltimore, MD. Contact: Technomic Publishing Co. at the address given above.

Seminar on **Test Methods for Composite Materials,** October 28-30, 1992, Sheraton Colony Square Hotel, Atlanta, GA. Contact: Technomic Publishing Co. at the address given above.

Seminar on **Composite Structures for Biomedical Applications,** November 5, 1992, Sheraton Colony Square Hotel, Atlanta, GA. Contact: Technomic Publishing Co. at the address given above.

Seminar on **Silicones for Biomedical/Pharmaceutical Applications,** November 6, 1992, Sheraton Coloy Square Hotel, Atlanta, GA. Contact: Technomic Publishing Co. at the address given above.

Seminar on **Regid Polyurethane Foam Processing,** November 5-6, 1992, Souffer Harborplace Hotel, Baltimore, MD. Contact: Technomic Publishing Co. at the address given above.

Seminar on **Hydrogels: Speciality Plastics for Biomedical and Pharmaceutical Applications, November 9-10, 1992, Souffer Harborplace Hotel, Baltimore, MD. Contact: Technomic Publishing Co. at the address given above.**

Conference on Polymers and Biotechnology, November 9-10, 1992, Sheraton Colony Square Hotel, Atlanta, GA. Contact: Technomic Publishing Co., at the address given above.

Seminar on **Urethane Catalysis,** November 16-17, 1992, Sheraton Colony Square Hotel, Atlanta, GA. Contact: Technomic Publishing Co., at the address given above.

Seminar on **Aerogels,** December 10-11, 1992, Sheraton Grand on Harbor Island, San Diego, California, USA. Contaact: Technomic Publishing Co. at the address given above.

EUROPE

Third CESIO International Surfactants Congress & Exhibition, June 1-5, London, United Kingdom. Contact: Tel: 44 0625, 618507; Fax: 44 0625 610260.

The Chemical Week Central and East European Conference: Emerging Opportunities in an Evolving Market, June 8-11, Warsaw, Poland. Contact: 212 621 4900; Fax: 212 621 3950.

Rubber and Eastern Europe 1992, June 11-12, London, United Kingdom. Contact: First Europe Communications, Tel: +44 71 221 2291; Fax: +44 71 229 2636.

The 20th Annual International Pharmaceutical Conference, June 15-17, Paris, France. Contact: Elene Riordan, Management Centre Europe, Tel: +32 2 516 1911; Fax: +32 2 513 7108.

The International Ion Chromatography Symposium 1992, September 21-24, Linz, Auztria. Contact: Janet Strimaitis, Century International, in the U.S. Tel: 508 359 8777; Fax: 508 359 8788.

Finnish Chemical Congress and Exhibition, October 3-5, 1992, Fair, Centre, Helsinki, Finland. Contact: Suomen Messut, Fach 21, 00521, Helsinki 52, Finland. Tel: 15091; Fax: 142358; Telex: 121119.

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Sulphur

Industrias Purace S.A., Carrera 40, No. 11-59, Urbanizacion Acopi, P.O. Box: 5676, Cali, Valle, Colombia. Fax: 653078; Telex: 5544 INPUR.

Paraffin

Eastern Europe Inc., Attention: Dr. Robert Ross, 460, West 34th Street, 12th Floor, New York, NY 10001, United States. Tel: 212-9478585.

Copper oxide (black powder, used as fertilizer or as a component of concentrates for animals); Heptahydrated magnesium sulphate (granular white powder); Zinc oxide (grey powder containing 70% of ZnO; heptahydrated zinc sulphate, granulated white powder)

Minerals Exclusivos y Cia. S.C.A., Carrera 5 No. 12-49, Sur, P.O. Box: 4448, Santafe de Bogota, D.C., Columbia. Tel: 7813351, 7812670; Fax: 7816579.

Calcium hypochlorite

Compania de Sintesis de Productos Quimicos S.A., Tte. Gral. Peron 2630, 5°C, 1040 Buenos Aires, Argentina. Tel: 9511765, 9511465; Fax: 9538445; Telex: 21420.

Potassium sulphate

B. Altman & Cia. S. en C., P.O. Box: 20264, Cali, Valle, Colombia. Tel: 923-694977; Fax: 923-694977; Telex: 55922.

Aluminium silicates for the rubber, paint and gum industries

Venesolana de Silicatos C.A., Venesil, Edf. Iasa, Piso 7°, Ofc. 701, Plaza La Castellana, Caracas, Venezuela. Tel: 582-321274; Fax: 582-616922. Telex: 23672 VENSI VC.

Detergents

Tensoactivos Yare S.A., Attention: Carlos E. Martinez, Ave. Orinoco, Edf. El Portal, Piso 2°, Las Mercedes, Caracas 1060, Venezuela. Tel: 2926363, 2919363; Fax: 2927496; Telex: 29368 FURYO.

Wyandotte de Venezuela C.A., Ave. Principal Colinas de Bello Monte, Edf. Oficentro Colinas, Caracas, Venesuela. Tel: 7520055.

Proctor & Gamble de Venezuela C.A., Attention: Jose Rafael Rivas, Edf. Torre Las Mercedes, Piso 7°, Ave. La Estancia, Urbanizacion Chuao, P.O. Box: 61160, Caracas, Venezuela. Tel: 91-9777, Fax: 2066334; Telex: 23460.

Fungicides

Shell Colombia S.A., Carrera 7 No. 73-47, P.O. Box: 58642, Santafe de Bogota, D.C., Colombia. Tel: 571-2100100; Fax: 571-2173600; Telex: 44792.

Polyethylene, high density

Plasticos del Lago C.A., Attention: Henri Levi, Ave. Francisco de Miranda, T. Bazar Bolivar, Piso 7°C, El Marques, P.O. Box: 2858, Caracas, Venezuela. Tel: 2398669; Fax: 239729; Telex: 62576.

Polyvinyl chloride

Petroquimica Colombiana S.A., Calle 8B No. 68-25, P.O. Box: 14451, Santafe de Bogota, D.C., Colombia. Tel: 1-2622811, 1-2618143; Fax: 1-262-7502; Telex: 44668 PETQ CO.

Polystyrene resins

Eastern Europe Inc., Attention: Dr. Robert Ross, 460, West 34th Street, 12th Floor, New York, NY 10001, United States. Tel: 212-9478585.

Polyurethane

Schori Argentina, Bernardo Metzig 1493, (1657), Loma Hermosa, Buenos Aires, Argentina. Tel: 541-7692502, 541-7690922; Fax: 541-7692438.

Bauxite; titanium dioxide

Eastern Europe Inc., Attention: Dr. Robert Ross, 460, West 34th Street, 12th Floor, New York, NY 10001, United States. Tel: 212-9478585.

Sulphuric acid

Produven C.A., Attention: Michel Duflos, Ave. Francisco de Miranda, Centra Plaza, Torre C, Piso 19, Ofc. E, P.O. Box: 62459, Caracas, Venezuela. Tel: 2832369; Fax: 2833465; Telex: 25486.

Sulphur dioxide

Derivados del Azufre S.A., Parque Industrial Juanchito, P.O. Box: 590, Manizales, Caldas, Colombia. Tel: 68-745045, 68-745880, Fax: 68-745922; Telex: 083511 DASA CO.

Ammonia alum

Laura Huertas de Ceron, Carrera 35 No. 17-67, Pasto, Colombia. Tel: 33984.

Sodium pyrophsophate

Productora Andina de Acidos y Derivados, Transversal 6 No. 14-60, Entrada 1, Cazuca, P.O.Box: 8598, Santafe de Bogota, D.C., Colombia. Tel: 571-776-7866; Fax: 571-7756400; Telex: 42363 PAAD CO.

Herbicides

Shell Colombia S.A., Carrera 7 No. 73-47, P.O. Box: 58642, Santafe de Bogota, D.C., Colombia. Tel: 571-2100100; Fax: 571-2173600; Telex: 44792.

Polypropylene resins

Polipropileno de Venezuela S.A., Propilven, Attention: Freddy Goerke, Ave. 4, Bella Vista/Cruce, Calle 85 (Falcon), Edf. Banco Caracas, Piso 7°, Maracaibo, Estado Zulia, Venezuela. Tel: 061-227605; Fax: 061-226937.

Polyvinyl chloride

Plasticos Petroquimica C.A., Petroplas, Attention: Carlos Rico, Ave. Francisco de Miranda Con., Mis Encantos, Torre Pequiven, Chaco, P.O. Box: 1066, Caracas, Venezuela. Tel: 201-3111, 2014111; Fax: 910186; Telex: 23206.

EXPORT OPPORTUNITIES

Natural graphite

Gelter Ringsdorff S.A., C/ Antracita, 10,. 28045 Madrid, Spain. Tel: 91-227-1427; Fax: 91-2390271; Telex: 42861.

Hispanoflx S.A., C/Andres Obispo, 37, 28043, Madrid, Spain. Tel: 91-200-3089; Fax: 91-7591898. Telex: 49206.

Gypsum

Higgis and Hill Overseas Ltd., Attention: Mr. R.W. Burton, Crown House, Kingston Road, New Malden Surrey KT3 3SY, United Kingdom. Tel: 81-9428921; Fax: 81-9499280.

Titanium dioxide

Ya Chung Industrial Co. Ltd., Attention: Eliot Liao, 7F, No. 112, Sec. 2 Chung S, Taipei, Taiwan ROC. Tel: 2-5366677; Fax: 5-5617657.

Sulphuric acid

Hondon Ltd., Attention: Andrew W.T. Wong, Sloane House, 34-A, Brighton Road, Surbiton Surry KT6, 5PQ, United Kingdom. Tel: 81-390-3562; Fax: 81-3905400.

Phosphoric acid

Ercros S.A., C/ Claudio Coella, 78, 2801, Madrid, Spain. Tel: 91-4351664; Fax: 91-5227275; Telex: 43772.

Klauz Wiecher y Compania S.A., C/ Guadiana, 13, 28002 Madrix, Spain. Tel: 91-4111366; Fax: 91-2614713; Telex: 43384 WECA E.

Sodium hydrosulphite

Reactivos y Productos Quimicos, Attention: Juan A. Gutierrez, Ave. La Estancia Centro Banaven, Torre B, Piso 2°, Ofc. B-2, Caracas, Venezuela. Tel: 02-924556; Fax: 02-916767.

Sulphates

Becamo S.A., Paseo Habana 141, 28036 Madrix, Spain. Tel: 91-4594562; Fax: 91-4588696; Telex: 42189 JCARD E.

Celestino unquera S.L., C/Ramiro II, 10, 28003 Madrid Spain. Tel: 91-254-9411; Telex: 43595 CEJU E.

Calcium carbonate

Spenro Industrial Supply, Attention: Bob Spencer, 1111 W.N. Carrier Pry, Grand Prairie, TX, United States. Tel: 214-6471072.

Methanol

Forestal del Atlantico S.A., Attention: Victor Pazos, Punta Promontoria S/N, Mugardos, La Coruna 15620, Spain. Tel: 3481-470750; Fax: 3481-470161.

Detergents

Sangeeta Traders, P.O.Box: 2140, Dubai, United Arab Emirates.

Polyethylene (high and low density), poly propylene

Banko Vaf C.L., Rosario, Santa Fe 1056, Argentina. Tel: 5441-256368, 5441-256369; Fax: 5441-257979; Telex: 41368 VAF AR.

Sodium sulphite

Reactovos y Productos Quimicos, Attention: Juan A. Gutienrrez, Ave. La Estanica Centro Banaven, Torre B, Piso 2°, Ofc. B-2, Caracas, Venezuela. Tel: 02-924556, Fax: 02-916767.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Baroda Municipal Corporation, Attn: Project Engineer (Gas) Gas Project Office, Dandia Bazar, Baroda 390 001.	Ethyl mercaptan 98% purity	400 Ltrs.	PRO/40/1992-93 (Gas)	5.6.92
Indian Petrochemicals Corpn. Ltd., Attn: Materials Manager (Chemicals Section), EIL Project Building, 2nd Floor, P.O. Petrochemicals 391 346, Dist. Vadodara, Gujarat.	Oxygen gas UHB nitrogen gas	3200 cylinders 1000 cylinders	MM.50.92.032 MM.50.92.033	23.6.92 "
Indian Petrochemicals Corpn. Ltd., Attn: Sr. Marketing Manager, International Business Group, PMDI Building, 2nd Floor, P.O. Petrochemicals - 391 346, Dist. Vadodara, Gujarat.	Linear low density polyethylene (LLDPE) Grade I - 1700 tonnes Grade II - 3,500 tonnes Grade III - 700 tonnes Grade IV - 200 tonnes.	6,100 MT	IPCL/IBG/LLDP/01/92	8.6.92
Paradeep Phosphates Ltd., 210, Mansarovar Building, 90, Nehru Place, New Delhi	Rock phosphate Sulphur	2,35,000 MT ± 10% 80,000 MT ± 10%	F1/ROCK/1 F1/SUL/2	1.6.92 2.6.92
Pune Telecom Attn: General Manager, 5th Floor, 776-A, Sadashiv Peth, Bizzy Land Commercial Complex, Pune 411 030.	Sulphuric acid (battery grade)			27.5.92
OFFERS FOR SALE				
Hindustan Insecticides Ltd., Attn: Commercial Manager, Udyogamandal 683 501, Kerala.	Isophoron (91% purity) Dimethyl formamide (96%)	4 MT 1.5 MT		8.6.92
Asst. Collector of Customs (Disposals) New Customs House, 3rd Floor, Ballard Pier, Bombay 400 038.	Organic sulphonic acid synthetic (supply by Lubrizol Corp., Ohio, U.S.A.)	80.6 MT		29.5.92

INTERNATIONAL BULK CHEMICAL PRICES

SPOT PRICES AS ON APRIL 29, 1992

Product		European Price range	US Price range
Naphtha		$182-184m.t. (cif)	
Gasoil		$175-176/m.t. (cif)	
Propane			29-29.5 cts/gal (fob)
Butane			33-33.5 cts/gal (fob)
Ethylene		$375-385/m.t. (cif)	14-15 cts/lb (del)
Propylene —	Chemical grade	DM600-622/m.t. (cif)	13-14 cts/lb (del)
	Polymer grade	DM640-650/m.t. (cif)	14.5-15 cts/lb (del)
Butadiene		$215-220/m.t. (fob)	12-13 cts/lb (cif)
Benzene		$345-355/m.t. (fob)	$1.18-1.20/gal (fob)
Toluene		$280-290/m.t. (fob)	89-90 cts/gal (fob)
Xylenes —	Virgin	$300-310/m.t. (cif)	
	Solvent	$285-305/m.t. (fob)	89-90 cts/gal (fob)
Para-xylene		$375-385/m.t. (fob)	17.5-18 cts/lb (fob)
Ortho-Xylene		$370-380/m.t. (fob)	17-18 cts/lb (fob)
Styrene —	T1	$480-490/m.t. (fob)	
	T2	$505-515/m.t. (fob)	19.75-20.25 cts/lb (fob)
Methanol —	T1	$110-120/m.t. (cif)	
	T2	DM190-200/m.t. (fob)	36-38 cts/gal (fob)
MTBE		$310-315/m.t. (fob)	85-88 cts/gal (fob)
INORGANICS			
Caustic soda		$240-260/m.t. (fob)	$250-265/m.t. (fob)
Soda ash		$180-190/m.t. (fob)	$145-170/m.t. (fob)
POLYMERS			
LDPE	Film grade	$690-730/m.t. (fob)	$680-700/m.t. (fob)
LLDPE	Butene-based	DM1.05-1.15/kg (del)*	$595-630/m.t. (fob)
	Hexene-based	DM1.15-1.20/kg (del)*	
	Octene-based	DM1.60-1.75/kg (del)*	
HDPE	Blow-moulding	$640-690/m.t. (fob)	$550-580/m.t. (fob)
	Inj. moulding	$620-660/m.t. (fob)	$550-570/m.t. (fob)
PP	homo-injection	$660-700/m.t. (fob)	$550-580/m.t. (fob)
	copolymer	DM1.15-1.30/kg (del)*	40-46 cts/lb (del)*
PS	general purpose	$665-725/m.t. (fob)	$680-690/m.t. (fob)
	high impact	$690-750/m.t. (fob)	$730-740/m.t. (fob)
PVC	general purpose	$430-450/m.t. (fob)	$450-480/m.t. (fob)

* Contract price

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
			BOMBAY PORT	
25/5	Ever Bridge (Pan) (Voy-615)	Greenways	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon; Manchester; Avonmouth; Bremen; Belfast and all destinations in U.K.; Germany; Switzerland; Austria & Scandinavian Ports. (Carting at F-PD).	28/5
		Arebee/	P. Said; Alexandria; Piraeus; Venice; Trieste; Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Revenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). (Carting at M.O.D. No. 1).	
		Marine Trans/	Antwerp; Rotterdam; Hamburg; Bremen; Bremerhaven; Felixstowe; Hull; Copenhagen; Gothenburg; Aarhus; Oslo; Stockholm; Helsinki; Limmassol; Izmir; Mersin; Istanbul; Marseilles; Valencia; Larnaca; La Spezia; Casablanca; Piraeus. (Carting at E-Shed Grain Depot).	
		M.C.S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antewerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapdst; Russia. (Carting at M.O.D. No. 2).	
		Parekh/	Felixstowe; Hamburg; Bremen; Antwerp; Rotterdam; London; Manchester; Liverpool; Birmingham; Leeds; Glasgow; Aarhus; Copenhagen; Gothenburg; Malmao; Oslo; Larnaca; Limmassol; Piraeus; Istanbul; Izmir; Mersin; Lattakia; Beirut; P. Said; Alexandria. (Carting at M.O.D. No. 1).	
		POL India/	Thames Port (London); Manchester; Liverpool; Birmingham; Hamburg; Bremen; Rotterdam; Antwerp; Le Havre; Gdynia; Gdansk; Aarhus; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Other Poland inland destinations; Genoa; Naples; Valencia; Izmir; Marseilles; Barcelona; Alexandria; Lattakia; Mersin; Dammietta; Beirut; Haifa; Ashdod. (Carting at Timber Pond No. 3).	
		J. Mackintosh	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
29/5	Lanka Amitha (V-26/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	2/6
22/5	Hrvatska	Oceanic	Jeddah; Rijeka;Trieste.	28/5
22/5	Travanti	Chowgule	Aden; Hodeidah; Aqaba.	30/5
21/5	Ermioni	Jades Ship	Sharjah	28/5
25/5	Ever Bridge (V-615) (Pan)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sacramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas; Various inland destinations. (Carting at F-PD).	28/5
		Marine Trans/	South & Central American Ports. (Carting at E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Long Beach; Boston; Norfolk; Charleston; Jacksonville; Miami; New Orleans; Oakland; San Francisco. (Carting at M.O.D. No. 2).	
		Arebee	Halifax; Montreal; Toronto; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas; Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tijuana; Veracruze; Mexico; Sao Francis Do Sul; Carribbean; Central & South American Ports. (Carting at M.O.D. No. 1).	

(1)	(2)	(3)	(4)	(5)
25/5	Hoegh Dene	Patvolk	Montreal and Toronto via Halifax; New York; Boston; Norfolk; Charleston; Savannah; Wilmington; Philadelphia; Baltimore and FCL Houston; New Orleans; Chicago; Milwaukee; Atlanta; Dallas; Tampico; Mexico City; Veracruz; San Louis Potossi. (Crtg. at Hay Bunder 5).	27/5
25/5	Cape Ray (Voy-2204)	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orelans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American & Pacific Ports. (Carting at B-PD).	27/5
		Trident	S. American; Carribbean & Central American Ports. (Carting at 12B-ID).	
25/5	Cape Ray (Voy-2204)	J. Mackintosh/ Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 2 for J. Mackintosh) (Carting at 12B-ID for Trident).	27/5
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S./	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari	Melbourne; Sydney; Brisbane. (Carting at F.B. No. 3).	
3/6	Banglar Maya (Voy-03)	Sai Ship/	Mombasa; Dar Es Salaam (Direct); Zanzibar; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at M.O.D. No. 2).	7/6
		C.M.B.	Dar Es Salaam; Mombasa (Direct); Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in E. Africa. (Carting at E. Grain Depot).	
25/5	Ever Bridge (V-615)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at F-PD).	28/5
		M.C.S.	Far East and Japan Ports. (Carting at M.O.D. No. 2).	
25/5	Cape Ray (V-2204)	J. Mackintosh	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang; Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Battar; Yokohama; Nagoya; Kobe; Ho Chi Minh; Main Chinese Ports. (Carting at Frere Basin No. 2).	27/5
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 12B-ID).	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at B-PD).	
		Silvership/	Far East Ports. (Carting at F.B. No. 1).	
		Beacon/	Far East; Main Japan and Chinese Ports. (Carting at E-Shed Gr. Depot).	
		Lucky Mari.	Singapore Penang; P. Kelang; Bangkok; Manila; Surabaya; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kaohsiung; Keelung; Busan; & Chinese Ports. (Carting at F.B. No. 3).	
24/5	Pavlodar	Transocean	Singapore; Kobe; Nagoya; Vladivostock.	31/5

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

MATERIALS IMPORTED BOMBAY
(From 21.4.92 To 23.4.92)
(Continued from previous issue)

TITANIUM DIOXIDE: From USA: Bombay Paints Ltd., 5,000 Kgs., Rs. 2,36,603; Rajiv Plastic Inds., 4,000 Kgs., Rs. 1,89,283.

TRIMETHYL PHOSPHITE: From USA: Khatau Junker Ltd., 46,440 Kgs., Rs. 33,33,457; Lupin Laboratories Ltd., 16,550 Kgs., Rs. 11,93,213.

YELLOW PHOSPHORUS: From China: Excel Inds. Ltd., 32 Mts., Rs. 13,24,978.

DRUG MATERIALS IMPORTED BOMBAY
(From 21.4.92 To 23.4.92)

D-CALCIUM PANTOTHENATE USP: From Japan: Pradipkumar & Co., 500 Kgs., Rs. 2,16,710.

DL TETRAMISOLE HCl BPV: From China: Dilipkumar & Co., 500 Kgs., Rs. 1,83,756.

IMIDAZOLE: From Germany: Ronuk Industries Ltd., 200 Kgs., Rs. 54,112.

INOSITOL: From China: Bhairavi Pharmaceuticals, 500 Kgs., Rs. 2,36,603.

LACTOSE: From Netherlands: Glaxo India Ltd., 36,000 Kgs., Rs. 10,20,232.

LACTOSE IP/BP/USP 200 MESH: From Netherlands: Pragati Chemicals, 36 Mts., Rs. 11,51,714.

MANNITOL USP: From Germany: Sevantilal and Sons, 5,000 Kgs., Rs. 4,98,664.

MEFENAMIC ACID BP 88: From Korea: Blue Cross Labs Ltd., 1,000 Kgs., Rs. 3,74,780.

SULPHADOXINE BP 88: From China: Torrent Laboratories Ltd., 700 Kgs., Rs. 7,29,984.

PLASTIC MATERIALS IMPORTED BOMBAY
(From 21.4.92 To 23.4.92)

HDPE: From Brazil: Gujarat Metal Cast P. Ltd., 10 Mts., Rs. 2,14,422; From Canada: Ganapati Fishing Lines P. Ltd., 35 Mts., Rs. 5,93,024; Shree Venkatesh Inds., 20,000 Kgs., Rs. 4,01,473; From Italy: Hill Packaging Ltd., 32 Mts., Rs. 7,28,738; Metro Dye Chem (India) Ltd., 16,000 Kgs., Rs. 3,23,200; From Japan: TPI India Ltd., 16.1 Mts., Rs. 2,94,186; From Korea: A-1 Arts, 16 Mts., Rs. 3,46,400; Ashish Trading Co., 32 Mts., Rs. 6,84,954; Associated Plastic Inds., 8 Mts., Rs. 1,75,739; Beevees Associates, 8 Mts., Rs. 1,58,095; B.S.G. Investment Corpn., 32,000 Kgs., Rs. 7,44,634 Cannon Steels P. Ltd., 48 Mts., Rs 10,84,315; Gelra Agencies, 17 Mts., Rs 3,53,095; Gilt Pack Ltd., 15 Mts., Rs 3,49,686; Gujarat Plastic Inds., 32 Mts. Rs. 7,45,679; Hico Enterprises, 45 Mts. Rs. 9,07,518; Indochem and Polymers 96 Mts., Rs. 22,61,640; International Traders, 48 Mts., Rs. 10,39,182; Ja Fibres Ltd., 64 Mts., Rs. 14,87,492 Kailaschand S. Kumar Plast P. Ltd., 8 Mts., Rs. 1,63,709; Kalpesh Plastic Inds., 16 Mts., Rs. 3,51,145. K. Raheja Mercantile Coprn., 32 Mts., Rs 6,72,782; Mahalchand Motilal Kothar & Co., 16 Mts., Rs. 8,18,925; Maharashtra Plastic Inds., 32 Mts., Rs 7,54,830; Metro Dyechem India Ltd. 16,000 Kgs., Rs. 3,11,888; Naresh Paper Bag Co., 16 Mts., Rs. 3,51,145 Nikeon Corpn., 48 Mts., Rs. 10,54,965 Omniplast Bombay P. Ltd., 16 Mts., Rs 3,27,760; Pankaj Petropack P. Ltd., 16 Mts., Rs. 3,67,195; PCL Enterprises Ltd., 112 Mts., Rs. 24,62,650; Polychroic Inds., 8 Mts., Rs. 1,63,707;

Riviera Polymers P. Ltd., 16 Mts., Rs. 3,72,916; Sachdev Inds., 16 Mts., Rs. 3,64,205; Safire International, 32,000 Kgs., Rs. 7,34,678; Saraf Impex, 48,000 Kgs., Rs. 10,55,097; Sephaire, 32,000 Kgs., Rs. 7,02,580; Supra Plast, 48 Mts., Rs. 11,02,224; Texel Plastics P. Ltd., 32 Mts., Rs. 7,04,122; From Saudi Arabia: Agro Plast, 16.500 Mts., Rs. 3,82,562; Diamond Polyprints, 34.300 Mts., Rs. 8,06,476; Marico Inds. Ltd., 51.450 Mts., Rs. 12,01,067; Nilkamal Crates and Containers, 15 Mts., Rs. 11,31,963; Satyanarayan Plastic Inds., 16.5 Mts., Rs. 3,82,561; From Singapore: Paper Plast Inds., 17 Mts., Rs. 3,63,572; Polyprint Inds., 17 Mts., Rs. 3,63,572; Regent Plast Ltd., 17 Mts., Rs. 3,63,572; From USA: Adarsh Packers P. Ltd., 17,500 Kgs., Rs. 3,61,281; Avadh Polytubes P. Ltd., 16.500 Mts., Rs. 3,17,196; Bajaj Plastic Ltd., 1,92,500 Kgs., Rs. 42,96,715; Goldcoin Polypack P. Ltd., 35 Mts., Rs. 7,11,446; Pushpa Impex P. Ltd., 17.500 Mts., Rs. 3,26,068; R.K. Trading Co., 35 Mts., Rs. 6,96,218; Subhash Corpn., 35 Mts., Rs. 6,52,138; The Supreme Inds. Ltd., 52.5 Mts., Rs. 12,11,847; Tirupati Fibre Inds., 8.250 Mts., Rs. 1,45,195; Vishal Plastomer P. Ltd., 17.500 Mts., Rs. 3,33,491.

LDPE: From Brazil: The Supreme Inds. Ltd., 50 Mts., Rs. 11,93,943; From UAE: Gujarat Polyweave Ltd., 16.500 Mts., Rs. 4,08,764.

LLDPE: From Saudi Arabia: Jamnadas Murlidhar Jaisingh, 49,500 Kgs., Rs. 10,24,787; Shreyas Chemicals, 16.5 Mts., Rs. 3,66,840; The Supreme Inds. Ltd., 24.99 Mts., Rs. 21,22,429; From USA: Mafatlal Inds. Ltd., 2 Mts., Rs. 1,99,930; The Supreme Inds. Ltd., 58.334 Mts., Rs. 10,52,403.

POLYETHYLENE: From Japan: Videocon Appliances Ltd., 4 Mts., Rs. 4,25,609; From Korea: Calcutta Industrial Corpn., 48 Mts., Rs. 10,12,133.

POLYETHYLENE TEREPHTHALENE: From Japan: Pinsel Computer Products, 18 Mts., Rs. 5,10,648.

POLYOL: From Germany: Milton Plastics, 8.385 Mts., Rs. 3,47,186.

POLYPROPYLENE: From Australia: Furn Plastic Inds. Ltd., 64 Mts., Rs. 15,44,855; Gujarat Polyweave Ltd., 96.75 Mts., Rs. 18,88,748; From Brazil: A-1 Art, 27 Mts., Rs. 5,67,444; Alpha Sales Corpn., 36 Mts., Rs. 7,04,664; Borana Plastics P. Ltd., 20 Mts., Rs. 4,03,944; Jyemko, 20 Mts., Rs. 4,00,950; Naresh Traders, 27 Mts., Rs. 5,60,526; Pan Asia Inds. Ltd., 61 Mts., Rs. 12,15,769; Premier Polymers, 16 Mts., Rs. 3,13,598; Security Payments & Fin. P. Ltd., 20 Mts., Rs. 4,03,342; Shakti Spinners P. Ltd., 63 Mts., Rs. 13,24,134; The Supreme Inds. Ltd., 147 Mts., Rs. 30,43,877; From France: Planters Polysacks Ltd., 99.900 Mts., Rs. 21,83,965; From Italy: Nilkamal Crates & Containers, 15 Mts., Rs. 3,90,395; From Japan: Machino Plastics Ltd., 45 Mts., Rs. 34,65,619; M.P. United Polypropylene Ltd., 15 Mts., Rs. 6,90,801; Okay Inds., 15 Mts., Rs. 3,35,415; From Japan: Videocon Appliances Ltd., 11 Mts., Rs. 4,36,763; From Korea: Aeron Udyog, 15 Mts., Rs. 3,25,372; Cyma Dassani Marketing P. Ltd., 15.500 Mts., Rs. 2,84,006; D.V. Polymers, 32 Mts., Rs. 6,65,300; Gilt Pack Ltd., 15 Mts., Rs. 3,16,764; Jhaveri Polymers P. Ltd., 48 Mts., Rs. 9,61,874; Kamlex Polytex P. Ltd., 16,000 Kgs., Rs. 3,33,626; M.P. United Polypropylene Ltd., 15 Mts., Rs. 6,90,801; Overseas Trading Corpn., 16,000 Kgs., Rs. 3,32,434; Pradeep Plastics Inds., 30 Mts., Rs. 6,88,063; Print Pack Packaging, 30 Mts., Rs. 6,79,957; Sushil Chemicals, 15 Mts., Rs. 3,20,466; Swati Growth-Funds Ltd., 46,500 Kgs., Rs. 10,09,911; From Singapore: Narendra Plastics, 16 Mts., Rs. 3,54,180; From Thailand: Atul Enterprises, 16 Mts., Rs. 3,90,034; Diamond Polyplast P. Ltd., 32,000 Kgs., Rs. 7,08,050; Diamond Polyprints, 16,000 Kgs., Rs. 3,54,025; Dinshaw Iron Works, 16 Mts., Rs. 3,90,034; Press-

well Inds., 16 Mts., Rs. 3,90,034; Techno Filters, 32 Mts., Rs. 7,80,046; From USA: Alpha Packaging P. Ltd., 144 Mts., Rs. 34,85,771; Cosmo Films Ltd., 102 Mts., Rs. 23,97,952; Rajasthan Petro Synthetics Ltd., 45 Mts., Rs. 10,71,934; Surendra International, 20 Mts., Rs. 4,17,634.

POLYSTYRENE: From Japan: Tulshan Trading Co. P. Ltd., 17 Mts., Rs. 3,51,947; Videocon International Ltd., 85 Mts., Rs. 18,35,586; From Korea: D.R. Polymers P. Ltd., 102 Mts., Rs. 22,19,856; K. Raheja Mercantile Corpn., 85 Mts., Rs. 18,48,748; Nivedya Udyog, 170 Mts., Rs. 36,59,078; Nutherm Packaging Group, 12 Mts., Rs. 3,77,310; Pannalal Banarsidass, 68 Mts., Rs. 13,82,952; Polyset Plastics Ltd., 87.51 Mts., Rs. 10,55,841; Satellite Plastic Industries, 17 Mts., Rs. 4,11,589; Shakti Industries, 8.5 Mts., Rs. 1,19,869; Siddharth Plastics, 68 Mts., Rs. 15,16,171; The Supreme Industries Ltd., 68 Mts., Rs. 15,48,568; V.K. Steels P. Ltd., 51 Mts., Rs. 10,59,261.

POLYTERPENE: From Japan: Bhor Industries Ltd., 2,000 Kgs., Rs. 82,811.

PVC RESIN: From Brazil: Marvel Vinyls Ltd., 50 Mts., Rs. 8,53,163; Pan Asia Inds. Ltd., 50 Mts., Rs. 7,94,032; Tainwala Chem & Plastics I Ltd., 279 Mts., Rs. 44,29,900.

PVC RESIN: From Japan: Atlas Wires Ltd., 2,000 Kgs., Rs. 3,60,312; From Korea: Gaurav Agroplast P. Ltd., 34 Mts., Rs. 5,45,317; Jayantilal Mangaldas & Sons, 64 Mts., Rs. 4,35,568; Jef PVC Pipes Ltd., 255 Mts., Rs. 43,83,319; Opal Agencies, 51 Mts., Rs. 8,77,481; The Supreme Inds. Ltd., 137.170 Mts., Rs. 27,22,001; Trimurti Foods and Pharmaceuticals, 102 Mts., Rs. 16,35,749; From Netherlands: Amartara Plastics Ltd., 51,000 Kgs., Rs. 9,31,392; From USA: Climax Exports P. Ltd., 136 Mts., Rs. 19,81,544; Coates India Ltd., 16,500 Lbs., Rs. 9,53,783; Finolex Coilcord P. Ltd., 180 Mts., Rs. 29,72,830; Gadia Chemoplast P. Ltd., 51.500 Mts., Rs. 7,84,116; Pittie Ferro Alloys Corpn., 150 Mts., Rs. 19,70,088.

STYRENE ACRYLONITRILE: From Korea: Milton Plastics, 17 Mts., Rs. 4,79,114.

MATERIALS IMPORTED BOMBAY (24.4.92)

ACRYLAMIDE: From Japan: Rishabh Metals and Chemicals P. Ltd., 5 Mts., Rs. 2,14,387.

ACRYLIC ACID: From Korea: Indofil Chemicals Co., 3,000 Kgs., Rs. 1,02,429.

ADIPIC ACID: From Germany: Hindustan Ciba Geigy Ltd., 20,000 Kgs., Rs. 6,98,742.

AEROSIL 200: From Germany: Aroma Agencies, 660 Kgs., Rs. 1,40,275.

ALPHA NAPHTHOL: From Japan: United Ink & Varnish Co. Ltd., 1,000 Kgs., Rs. 2,14,387.

AMMONIUM PENTABORATE: From Japan: Rescon Mfg. Co. P. Ltd., 500 Kgs., Rs. 51,232.

ANISIC ALDEHYDE: From Germany: Hindustan Lever Ltd., 2,00 Kgs., Rs. 9,61,447.

ARSENIC TRIOXIDE: From Philippines: K.T. Corporation, 40.50 Mts., Rs. 4,82,370.

BISPHENOL-A: From Japan: Resins & Plastics Ltd., 9,000 Kgs., Rs. 3,11,575; From USA: Uttamlal Exports Ltd., 13,000 Kgs., Rs. 4,33,537.

BUTYL ACRYLATE MONOMER: From Japan: Dai Ichi Karkaria Ltd., 14,400 Kgs., Rs. 4,71,079; Hetampurica Textiles, 28,800 Kgs., Rs. 9,42,158; Shah Chhacanlal Laxmichand, 14,400 Kgs., Rs. 4,41,963; From Korea: Monali Traders, 7,200 Kgs., Rs. 1,84,401.

BUTYL STEARATE: From Japan: Straw Products Ltd., 1,000 Kgs., Rs. 1,44,513.

CALCIUM SILICIDE: From Brazil: Shri Ishar Alloy Steels Ltd., 18,000 Kgs., Rs. 7,71,792.

CAPROLACTAM: From Netherlands: Shree Synthetics Ltd., 108 Mts., Rs. 51,10,629.

CARBON BLACK: From Germany: Rainbow Ink & Varnish Mfg. Co., 5,240 Kgs., Rs. 3,02,552.

CITRIC ACID MONO 99.5%: From China: ATC Exports, 20,000 Kgs., Rs. 5,84,739.

2-CYANO PYRAZINE: From Japan: Uni-Sankyo Ltd., 1,000 Kgs., Rs. 8,25,862.

DIETHYL CARBAMOYL CHLORIDE: From Germany: Chemipharm Chem & Pharmls., 1,900 Kgs., Rs. 3,19,693.

DL-2 AMINOBUTANOL: From Germany: Cadila Labs. Ltd., 15,210 Kgs., Rs. 42,41,365.

ETHYLENE DI BROMIDE: From Israel: Searle India Ltd., 2,700 Kgs., Rs. 94,627.

2-ETHYL HEXYL ACRYLATE: From Japan: Asian Paints I Ltd., 13,600 Kgs., Rs. 4,75,144; From Korea: Indofil Chemicals Co., 1,105 Kgs., Rs. 3,77,281.

FURFURYL ALCOHOL: From Thailand: Jadavji & Co., 1,920 Kgs., Rs. 99,373.

GLYCEROLDIGLYCIDYLETHER: From Germany: Century Enka Ltd., 1,000 Kgs., Rs. 2,59,900.

HYDRO PHTHALIC ANHYDRIDE: From Italy: Parikh Resin & Polymers, 640 Kgs., Rs. 63,291.

HYDROXYPHENYLGLYCINE: From Netherlands: Kopran Chemical Co. Ltd., 3,000 Kgs., Rs. 15,36,671.

ISOBUTYL STEARATE: From Belgium: Century Enka Ltd., 3,230 Kgs., Rs. 1,92,114.

LITHIUM CARBONATE: From USA: D.J. Fluorine, 1,000 Kgs., Rs. 1,51,977; Gujarat Machinery Mfg. Ltd., 2,994 Kgs., Rs. 4,04,143.

MALEIC ACID: From USA: Pioma Industries, 36,286 Kgs., Rs. 17,28,720.

METHYL ACETO ACETIC: From USA: Shree Ambica Chemical Inds., 15,336 kgs., Rs. 6,98,496.

MONOSODIUM GLUTAMATE 99.5%: From France: R.K. Chemicals, 18,000 Kgs., Rs. 7,08,904.

PARAFFIN WAX: From Germany: Indian Oil Corpn. Ltd., 500 Mts., Rs. 1,39,10,124.

PARAFORMALDEHYDE 91%: From Spain: Leo Dye Chem, 20,000 Kgs., Rs. 2,85,849.

POLYVINYL ALCOHOL: From Germany: BASF India Ltd., 1,920 Kgs., Rs. 1,55,062; Raygee Foam P. Ltd., 3,960 Kgs., Rs. 2,52,807; From Japan: Gupta Dyeing & Printing Mills, 2,000 Kgs., Rs. 1,15,344.

POTASSIUM CHLORIDE: From Canada: Colour-Chem Ltd., 20,000 Kgs., Rs. 1,52,453.

SILICON CARBIDE: From Germany: Sterling Abrasives P. Ltd., 18,000 Kgs., Rs. 5,73,854.

SODIUM METHYLATE/METHOXIDE: From Germany: Roche Products Ltd., 5,000 Kgs., Rs. 4,66,571.

SULFAMIDE ACETIC ACID: From Germany: Colour-Chem Ltd., 1,000 Kgs., Rs. 1,12,114.

TITANIUM DIOXIDE: From Germany: Grasim Ind Ltd., 17,500 Kgs., Rs. 13,89,544; From USA: The Supreme Inds. Ltd., 15 Mts., Rs. 7,62,264.

TOLUENE DI ISOCYANATE: From Singapore: Kaso Chemie India Ltd., 10 Mts., Rs. 6,66,981.

DRUG MATERIALS IMPORTED BOMBAY (24.4.92)

CHOLESTEROL USP: From Singapore: Intertraad Conet House, 300 Kgs., Rs. 3,43,972.

D-PARA HYDROXY PHENYL GLYCINE: From Singapore: Gujarat Lyka Organics Ltd., 3,000 Kgs., Rs. 17,21,288.

DRUG INTERMEDIATES: From Italy: Kemwell P. Ltd., 3,000 Kgs., Rs. 6,47,924.

LACTOSE: From Netherlands: Searle (India) Ltd., 10,000 Kgs., Rs. 3,11,491.

L-LYSINE MONO HCL USP: From Japan: Wallace Pharmls. Ltd., 500 Kgs., Rs. 73,939.

L-LYSINE MONO HCL: From Thailand: Sunnex Commercial P. Ltd., 5,000 Kgs., Rs. 3,62,299.

PARA HYDROXY PHENYL GLYCINE: From Singapore: Kopran Limited, 5,000 Kgs., Rs. 28,83,602.

SULPHADIAZINE BP: From China: Elegant Pharmls., 1,200 Kgs., Rs. 3,81,522.

PLASTIC MATERIALS IMPORTED BOMBAY (24.4.92)

HDPE: From Brazil: R.R. Polymers (P) Ltd., 50 Mts., Rs. 10,76,384; From Canada: Ganapati Fishing Lines P. Ltd., 8.75 Mts., Rs. 1,48,256; From Korea: Associated Plastic Inds., 8 Mts., Rs. 1,75,739; Fibroplast Corpn., 16 Mts., Rs. 3,41,978; Gilt Pack Ltd., 45 Mts., Rs. 10,49,058; Gupta Plastic Udyog, 16 Mts., Rs. 3,67,967; Himar Fabrics & Pkg. P. Ltd., 48 Kgs., Rs. 10,55,661; Jayantilal Mangaldas & Sons, 16 Mts., Rs. 3,56,244; K.D. Shanghvi & Co., 16,000 Kgs., Rs. 3,42,485; Mehta Traders, 8 Mts., Rs. 1,68,451; Naresh Paper Bag Co., 16 Mts., Rs. 3,51,145; Sidharth Plastics, 48 Mts., Rs. 10,70,256; Vishal Plastic Inds., 32 Mts., Rs. 7,16,248; From Saudi Arabia: Pratik Overseas Corpn., 34.300 Mts., Rs. 7,20,250; Rohit Petro Pack P. Ltd., 102.90 Mts., Rs. 22,36,830; From Thailand: Ashoka Polywares, 17 Mts., Rs. 3,80,094; From USA: Ganapati Fishing Lines P. Ltd., 20 Mts., Rs. 3,46,032; Govindlal Alokkuna Trading P. Ltd., 17.500 Mts., Rs. 3,61,281; Pari Plast P. Ltd., 35,000 Kgs., Rs. 7,11,446; Rohit Petro Pack P. Ltd., 52.5 Mts., Rs. 11,28,480; Shankar Packaging Ltd., 87.5 Mts., Rs. 19,68,490; Subhash Corporation, 17.500 Mts., Rs. 3,52,945; The Supreme Inds. Ltd., 35 Mts., Rs. 8,19,044.

LDPE: From Brazil: The Supreme Inds. Ltd., 195 Mts., Rs. 46,56,369; From Qatar: Finolex Cables Ltd., 198 Mts., Rs. 27,79,396.

POLYETHYLENE: From Belgium: Cable Corporation of India Ltd., 39,985 Kgs., Rs. 16,35,085; From Thailand: Daniel Philips & Co. P. Ltd., 17 Mts., Rs. 3,79,743.

POLYPROPYLENE: From Brazil: Chetan Inds., 18 Mts., Rs. 3,78,818; Interplast Indus., 41 Mts., Rs. 8,61,674; Naresh Traders, 9 Mts., Rs. 1,86,842; Polychroic Inds., 9 Mts., Rs. 1,81,536; Premier Polymers, 16 Mts., Rs. 3,13,598; Shakti Spinners P. Ltd., 9 Mts., Rs. 1,89,162; Shri Hanuman Overseas Corpn., 36 Mts., Rs. 7,27,400; From Korea: Naresh Paper Bag Co., 9 Mts., Rs. 1,94,880; Overseas Trading Corporation, 16,000 Kgs., Rs. 3,32,434; Prince Plastics, 97,250 Kgs., Rs. 5,14,324; Saraf Impex, 31,000 Kgs., Rs. 7,30,794; Swati Growth Fund Ltd., 16 Mts., Rs. 3,57,060; From Switzerland: Alembic Chem Works Co. Ltd., 16.250 Mts., Rs. 3,68,487.

POLYPROPYLENE: From Thailand: Con Amore Thermo Plastic P. Ltd., 32 Mts., Rs. 7,60,975; From USA: K.L.J. Plastics Ltd., 33 Mts., Rs. 7,15,718; Pfizer Ltd., 10,015 Kgs., Rs. 6,36,186; From Yugoslavia: Rupal Plastics P. Ltd., 15.500 Mts., Rs. 3,75,346.

POLYSTYRENE: From Japan: Delta Ltd., 17 Mts., Rs. 3,51,948; Peico Electronics & Electricals Ltd., 63.2 Kgs., Rs. 21,685; From Korea: Khemka Containers Ltd., 12 Mts., Rs. 4,03,107; Pannalal Banarsidas, 34 Mts., Rs. 6,91,476;

Shakti Inds., 25.5 Mts., Rs. 5,75,607; Siddharth Plastics, 51 Mts., Rs. 11,37,126; Thermopack Inds., 12 Mts., Rs. 3,91,834; Xpro India, 51 Mts., Rs. 13,00,827.

PVC RESIN: From Brazil Kundalia Industries, 20 Mts., Rs. 3,17,421; Nichketa Plast P. Ltd., 25 Mts., Rs. 4,08,712; From USA: Impex P. Ltd., 35 Mts., Rs. 5,63,308.

STYRENE MONOMER: From Australia: Metroproduct P. Ltd., 15.500 Mts., Rs. 3,75,346; Metro Products (India), 22,800 Kgs., Rs. 5,43,114.

SYNTHETIC RESIN: From USA: EPC Industries P. Ltd., 33 Mts., Rs. 10,53,333.

MATERIALS IMPORTED BOMBAY (27.4.92)

ACRYLAMIDE: From Japan: Mangala Trading Co., 15,000 Kgs., Rs. 6,19,339.

ALDEHYDE C-10: From Switzerland: Hindustan Lever Ltd., 510 Kgs., Rs. 1,45,706.

AMYL ALCOHOL: From Germany: Lubrizol India Ltd., 199.78 Mts., Rs. 65,90,137.

CARBON BLACK: From USA: Printing Inks Ltd., 2,200 Lbs., Rs. 81,310.

CHEMFLEX 115: From Japan: Goodlass Nerolac Paints Ltd. 204 Kgs., Rs. 56,272.

3-CHLORO 4-FLUORO ANILINE: From China: Ranbaxy Labs Ltd., 4,000 Kgs., Rs. 21,81,346.

CAPROLACTUM: From Belgium: The National Rayon Corpn. Ltd., 216 Mts., Rs. 1,09,76,604.

CYANURIC CHLORIDE: From Belgium: Ami Chemicals, 2,000 Kgs., Rs. 1,96,136; Appex Dyestuff Inds., 2,000 Kgs., Rs. 1,96,136; Atic Inds. Ltd., 24,000 Kgs., Rs. 23,53,622; Atlas Dye Chem Inds., 2,000 Kgs., Rs. 1,96,135; Bhavani Dye Chem Inds., 1,000 Kgs., Rs. 98,068; Evergreen Inds., 500 Kgs., Rs. 49,033; Hina Dye Chem Inds., 2,000 Kgs., Rs. 1,96,136; Khushboo Inds., 500 Kgs., Rs. 49,033; M.K. Soorenji & Co., 500 Kgs., Rs. 49,033; Narmada Chemicals, 500 Kgs., Rs. 49,033.

CYANURIC CHLORIDE: From Belgium: Shreenathji Chemicals Inds., 500 Kgs., Rs. 49,033.

DESMODUR T 80: From Germany: Jai Inds., 18,000 Kgs., Rs. 11,17,950.

DICUMYL PEROXIDE PERCUMYL D-98: From Japan: Mascot Udyog, 2,000 Kgs., Rs. 2,69,969.

DIMETHYL ACETAMIDE: From Germany: J.K. Synthetics Ltd., 30,400 Kgs., Rs. 15,96,690; From Turkey: J.K. Synthetics Ltd., 15,200 Kgs., Rs. 5,80,733.

DIMETHYL BENZYL CARBINYL ACETATE: From Switzerland: Hindustan Lever Ltd., 200 Kgs., Rs. 82,535.

DIMETHYL UREA: From Germany: Kores (India) Ltd., 10 Mts., Rs. 4,73,206.

DODECYL BENZENE SULFONIC ACID: From USA: Gujarat Apar Polymers Ltd., 6,532 Kgs., Rs. 3,86,381.

EPICHLOROHYDRIN: From Japan: Platewell Processes & Chemicals, 2,400 Kgs., Rs. 1,18,913; From USA: Cibatul Ltd., 91,352 Kgs., Rs. 36,26,789.

2-ETHYL HEXANOIC ACID: From USA: Modern Chemicals & Plastics, 13,392 Kgs., Rs. 4,55,417.

2 ETHYL HEXYL ACRYLATE: From Korea: Sanghi Leathers P. Ltd., 14 Mts., Rs. 4,86,518; Tulsi Agrochem P. Ltd., 13,600 Kgs., Rs. 4,18,759.

GAMMA FERRIC ACID: From Germany: Prakash Industries Ltd., 17.50 Mts., Rs. 26,64,511.

HEXA HYDROPHTHALIC ANHYDRIDE: From Germany: Baroda Bushings & Industries, 3,000 Kgs., Rs. 2,21,815.

3 HYDROXY ANILINE 4 CARBOXYLIC ACID: From Germany: Vipan Inds., 480 Kgs., Rs. 4,26,213.

HYDROXYETHYL CELLULOSE: From Netherlands: Heavy Chem Corpn., 1,750 Kgs., Rs. 3,14,037.

ISOBUTYL BENZENE: From USA: The Boots Company India Ltd., 27,314 Kgs., Rs. 26,45,934.

ISOPHTHALIC ACID: From Italy: Bakelite Hylam Ltd., 17,500 Kgs., Rs. 5,33,083.

LEVO NITRO BASE (L BASE): From Hong Kong: Nirav Fine Chemicals, 250 Kgs., Rs. 6,33,632.

LINEAR ALKYL BENZENE: From Belgium: Sahyog Intermediate P. Ltd., 40.800 Mts., Rs. 10,36,680.

METHACRYLAMIDE: From Germany: Pidilite Inds. Ltd., 300 Kgs., Rs. 46,316.

METHOCEL CELLULOSE: From USA: Mehul Trading Co., 90 Kgs., Rs. 54,630.

METHYL GLYCOL (ETHYLENE GLYCOL MONO METHYL ETHER): From UK: Bakelite Hylam Ltd., 15,600 Kgs., Rs. 4,66,436.

NAPHTHALENE CRUDE: From Egypt: Chemical Development & Const., 16,763 Kgs., Rs. 2,39,572.

PARACHLORO PHENYL ISO CYANATE; From Germany: Chemspec Chemicals P. Ltd., 3,500 Kgs., Rs. 6,95,269.

PARA CHLORO TOLUENE: From USA: Gujarat Insecticides Ltd., 29,393 Kgs., Rs. 12,76,030.

PHENYL ACETALDEHYDE DIMETHYL ACETAL: From Switzerland: Hindustan Lever Ltd., 200 Kgs., Rs. 1,33,320.

RED OXIDE: From Japan: Goodlass Nerolack Paints Ltd., 660 Kgs., Rs. 62,100.

THIOPHENOL: From USA: Boots Pharmaceuticals Ltd., 1,200 Kgs., Rs. 2,85,849.

TOLUENE DI ISOCYANATE: From USA: J.J. Foams P. Ltd., 19 Mts., Rs. 12,19,592.

TRI-BUTYLAMINE: From Germany: Organo Fine Chemicals, 930 Kgs., Rs. 70,138.

TURPENTINE OIL: From Indonesia: Twin City Organics P. Ltd., 40.8 Mts., Rs. 6,30,718.

PLASTIC MATERIALS IMPORTED BOMBAY (27.4.92)

HDPE: From Brazil: Gujarat Metal Cast P. Ltd., 10 Mts., Rs. 2,14,422; From Canada: Ganapathi Fishing Lines P. Ltd., 17.50 Mts., Rs. 2,96,498; Kalpesh Plastic Industries, 17.500 Mts., Rs. 3,31,244; From Japan: Narmada Extrusions P. Ltd., 16.5 Mts., Rs. 3,26,306; From Korea: Arihant Enterprises, 48 Mts., Rs. 10,86,558; Bombay Synthetics P. Ltd., 32 Mts., Rs. 6,99,566; Gilt Pack Ltd., 15 Mts., Rs. 3,49,686; Gupta Polymers P. Ltd., 45 Mts., Rs. 9,91,037; Hirachand & Co., 32 Mts., Rs. 7,53,380; Jeenal Enterprises, 16 Mts., Rs. 3,61,744; Jyothy Lab., 48 Mts., Rs. 10,58,121; Kosmo Packers, 16 Mts., Rs. 3,52,255; Lakshmans Plastics P. Ltd., 16 Mts., Rs. 3,82,114; Mahalchand Motilal Kothari and Co., 8 Mts., Rs. 1,63,785; Mehta Traders, 8 Mts., Rs. 1,68,451; Omniplast Bombay P. Ltd., 32 Mts., Rs. 6,55,520; Primo Pick N Pack P. Ltd., 48 Mts., Rs. 11,10,009; Ravi International, 156.96 Mts., Rs. 20,78,262; Shah & Merwade Packaging P. Ltd., 16 Mts., Rs. 3,72,096; Shalimar Pack., 32 Mts., Rs. 7,65,700; From Saudi Arabia: Alpha Packaging P. Ltd., 17.150 Mts., Rs. 4,19,420; P.X. Laminators, 17.150 Mts., Rs. 4,03,079;

From Thailand: M.S. Impex P. Ltd., 17 Mts., Rs. 3,88,470; From USA: Ganapati Fishing Lines P. Ltd., 8.75 Mts., Rs. 1,48,249; Kanpur Plastipack Ltd., 157.5 Mts., Rs. 35,14,554; Neo Sack Ltd., 35 Mts., Rs. 7,00,330; Pooja Inds., 17 Mts., Rs. 3,65,394; R.K. Trading Co., 17.500 Mts., Rs. 3,48,109; Shah Monofilament Plastic Inds., 16.78 Mts., Rs. 3,62,471; Shah Patel & Co., 16.500 Mts., Rs. 3,45,876; From USA: Southern Marketing Associates, 17 Mts., Rs. 3,68,556; The Supreme Inds. Ltd., 122.5 Mts., Rs. 27,30,149.

HDPE: From USA: Vishal Plastomer P. Ltd., 17.500 Mts., Rs. 3,33,491; From Yugoslavia: Caprihans India Ltd., 20,000 Kgs., Rs. 4,97,343; Delux Plastics, 50 Mts., Rs. 12,44,645; From Canada: D.S. Mehta and Co., 23.400 Mts., Rs. 3,86,467.

LDPE: From Qatar: Usha Beltron Ltd., 99 Mts., Rs. 23,89,698; From Yugoslavia: Modi Plastics Ltd., 100 Mts., Rs. 23,80,286; The Supreme Inds. Ltd., 100 Mts., Rs. 23,89,696; Vindhya Telelinks Ltd., 183 Mts., Rs. 43,30,201.

LLDPE: From Canada: The Bharat Vijay Mills Ltd., 100 Mts., Rs. 18,50,858.

POLYETHYLENE WAX: From Japan: Hindustan Spg. & Wvg. Mills Ltd., 4,000 Kgs., Rs. 2,09,622.

POLYPROPYLENE: From Australia: Rajasthan Petro Synthetics Ltd., 48,750 Kgs., Rs. 11,54,113; From Belgium: Angel Plastics, 30,000 Kgs., Rs. 6,65,447; From Brazil: Chetan Inds., 45 Mts., Rs. 9,47,045; Security Payments & Fin. P. Ltd., 30 Mts., Rs. 6,05,103; From Japan: Madhya Pradesh United Polymers, 45 Mts., Rs. 19,29,795; From Korea: D.V. Polymers, 16 Mts., Rs. 3,32,650; Gilt Pack Ltd., 15 Mts., Rs. 3,16,764; Gujarat Inds., 15.500 Mts., Rs. 3,66,446; Star Enterprise, 15 Mts., Rs. 3,39,596; Swati Growth Funds Ltd., 31.500 Kgs., Rs. 6,93,697; Vishal Plastics Inds., 16 Mts., Rs. 3,23,000; From Singapore: Bharat International, 11.6 Mts., Rs. 2,30,209; Haryana Petrochemicals Ltd., 1 Mt., Rs. 25,731; From Yugoslavia: Amar Enterprises, 31 Mts., Rs. 7,50,135; Ganapati Plastfab Ltd., 46.5 Mts., Rs. 11,30,187.

POLYSTYRENE: From Japan: Delta Ltd., 17 Mts., Rs. 3,51,948; From Korea: B.M. Plastochem, 17 Mts., Rs. 3,83,474; Gelra Agencies, 51 Mts., Rs. 10,59,285; K. Raheja Mercantile Corpn., 17 Mts., Rs. 3,84,350; Siddharth Plastics, 17 Mts., Rs. 3,79,042; Tainwala Chem & Plastics I Ltd., 68 Mts., Rs. 14,32,960; V.K. Steels P. Ltd., 34 Mts., Rs. 7,58,170.

PVC RESIN: From Korea: Gaurav Agroplast P. Ltd., 17 Mts., Rs. 2,72,624; From Mexico: Star Oxides & Chem Ltd., 104 Mts., Rs. 16,70,696; From Singapore: Tubeflex, 16 Mts., Rs. 3,09,987.

MATERIALS IMPORTED BOMBAY (28.4.92)

ACRYLAMIDE: From Japan: Jubiter Electronics, 3,150 Kgs., Rs. 1,30,061; Meta Chem Services, 15,000 Kgs., Rs. 6,28,868.

ALPHA ACETO GAMMA BUTYRO LACTONE (ACETO BUTYRO LACTONE): From Japan: Indian Drug & Pharma Ltd., 5,000 Kgs., Rs. 12,35,128.

ALUMINA CATALYSTS: From USA: Gujarat State Fertilisers Ltd., 27,200 Kgs., Rs. 17,70,866.

BENZALSODIUM CHLORIDE: From UK: Tolani Chemicals, 200 Nos. Rs. 29,482.

BISPHENOL A: From Japan: Pragati Chem Ltd., 7,000 Kgs., Rs. 2,42,336.

CARBON BLACK: From Germany: Goodyear India Ltd., 650 Kgs., Rs. 37,416; Lead Slips Products P. Ltd., 1,400 Kgs., Rs. 1,03,644; From Japan: Plasticolors Corporation, 96 Kgs., Rs. 67,999.

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National Natural Gas Scenario
Persistent prolonged flaring with anticipated shortages ahead

THE vagaries, vicissitudes, pitfalls and uncertainties of the planning process are nowhere more evident than in the case of the schedule for gas utilisation. The oil/gas ratio for associated gas was initially underestimated in the sixties with consequent undersizing of the submarine pipeline. When gas became available the infrastructure on the consuming end had not been provided for. On the HBJ pipeline, when the transmission line was got ready at a fabulous cost, again the consuming units are not ready. With the current massive planning for gas based units, the gas supplies are estimated to fall short of demand by the middle of this decade.

The colossal loss of an estimated Rs. 2,400 crores a year on account of the flaring of unutilised natural gas amounting to about 17 million cubic metres a day by the Oil and Natural Gas Commission and Oil India of what they produce is now said to have been brought down to about Rs. 1,600 crores and the flaring has been reduced to 11 million cubic metres a day. There is, however, no certainty about these estimates and they may not wholly tally with another set of figures relating to flaring resorted to by the ONGC and Oil India expressed in million cubic metres a year. But the fact cannot be disputed that huge quantities are still being flared.

The ONGC is hopeful that the implementation of the gas flaring project will totally eliminate gas flaring by 1994 in the western offshore area. Gas flaring has been mainly caused by the lack of adequate compression and transportation facilities for the evacuation of associated gas which in turn results from (i) inadequacy in pipeline capacities (ii) lack of flexibility in the pipeline network (iii) lack of inter-connecting facilities which prevents interchangeability of transportation of associated and non-associated gas.

The earlier measures by the ONGC included the Bombay High North compression facility for 2.1 million cubic metres a day which was completed in 1981.

Table - 1

VOLUME OF GAS FLARED BY ONGC

(in million cu.m/year)

	Production	Supply	Flaring
1980-81	1,610	975	592
1981-82	2,432	1,233	1,005
1982-83	3,470	1,861	1,268
1983-84	4,362	2,228	1,742
1984-85	5,599	2,792	2,092
1985-86	6,581	3,314	2,502
1986-87	8,163	5,044	2,141
1987-88	9,864	5,873	2,896
1988-89	11,705	6,976	5,381
1989-90	15,477	8,628	5,293
1990-91	16,480	9,902	4,778

Note: The figures do not include internal utilisation of gas.

Table - 2

VOLUME OF GAS FLARED BY OIL INDIA

(in million cu. m/year)

	Production	Utilisation	Flaring
1980	525.40	425.83	99.57
1981-82	1,655.40	1,065.10	590.30
1982-83	1,465.60	846.30	619.30
1983-84	1,598.70	826.20	772.50
1984-85	1,640.76	855.86	784.90
1985-86	1,552.89	935.79	617.10
1986-87	1,630.64	1,035.44	595.20
1987-88	1,566.63	1,039.83	526.80
1988-89	1,509.07	1,015.97	493.10
1989-90	1,511.70	1,070.10	441.60
1990-91	1,518.02	1,134.62	383.40

The other measures which were completed between 1981 and 1990 are the building of BHS platform with facility for compressing 2.25 million cubic metres a day, the SHB project platform with compression facilities for 4.5 million cubic metres a day, the NDG platform with a capacity for compressing 4.5 million cubic metres a day, the provision for diverting Bombay High associated gas to South Bassein platform and compression of five million cubic metres a day on BPA process platform complex for transportation of gas through the Bassein-Hazira pipeline and the commissioning of the 2.4 million cubic metres a day compressor on the Heera platform. A submarine pipeline from Heera to Bombay offshore to Uran was laid and it is transportaing about 3.4 million cubic metres of associated gas a day to Uran for minimizing flaring.

World Bank aided project

Flaring in the Western offshore area of the ONGC amounts to 8.33 million cubic metres a day. In 1990-91, the flaring which stood at 12.7 million cubic metres a day was brought down by the commissioning of a pipeline and gas compressor platform and increased internal utilisation, as well as reduced oil production. The project envisages the setting up of additional compressors and pipelines and is expected to cost about Rs. 7,500 crores of which a little over Rs. 5,000 crores will be in foreign exchange. The project will be supported by the World Bank with a loan of $ 450 millions and the Asian Development Bank from which a loan of $ 300 millions is expected. The balance foreign exchange will be coming from the Exim Bank of Japan and supplier's credit. The rupee component will be met by internal generation of resources by the ONGC. The components of the project are:

(i) A process platform which the government has already approved as part of the ONGC's L-III project. (ii) Another process platform which also has already been approved by the Government as part of the L-III project. (iii) Construction of the South Bassein to Hazira pipeline for which the proposal has been submitted to the Public Investment Board (PIB) for approval. (iv) Extension of the shore terminal at Hazira which is also awaiting the PIB's approval.

Low pressure gas was also being flared at Ahmedabad at the rate of four lakh cubic metres a day and at Mehsana for the same volume. A project costing Rs. 7.60 crores has been taken up to eliminate flaring at Ahmedabad. Flaring has already come down to two lakh cubic metres a day. Another project has been taken up at Mehsana and will be completed by November 1992. At Gandhar, the flaring has been brought down fro eight lakh cubic metres a day to two lakh cubic metre

In Assam, both Oil India and ONGC have had to fla one to 1.5 million cubic metres a day because of pau ity of consumers and the low offtake by consumers whom the gas has been committed. The early compl tion of the Amguir and Kathalguri power plants will co tribute to the reduction in gas flaring. Efforts are bei made to identify alternative consumers on fall-back bas until the two power plants come up. It is also propose to install low pressure compressors at Lakwa, Gale and Rudrasagar.

The Ministry of Petroleum and Natural gas has n placed the same high value of Rs. 2,400 crores for th 17 million cubic metres of gas flared till its subseque reduction to 11 million cubic metres, valued at Rs. 1,60 crores. Its own estimate of the economic value of th 17 million cubic metres of gas flared was Rs. 1,00 crores and the present value is placed at not more tha Rs. 500 crores.

GAIL's proposals

Foreign exchange constraints have necessari affected the implementation of projects having a sub stantial exchange component. Six projects with a tota estimated cost of Rs. 200 crores have been taken u by the GAIL. These cover a small LPG plant at Vagoc hia, and gas distribution networks around Delhi, in Gu arat, Maharashtra and Andhra Pradesh. During th Eighth Plan period, the GAIL has proposals for invest ments of over Rs. 6,000 crores on gas terminals, trans mission and city gas distribution projects, LPG extractio plants and petrochemical plants.

The GAIL has taken up the construction of th Tatipaka-Kakinada pipeline project in Andhra Prades estimated to cost Rs. 46 crores for the supply of gas t Nagarjuna Fertilizers and Chemicals. The pipelin crosses two large rivers, Vinateyam Godavari and Gaut hami Godavari, each of which involves about 1.5 to 1.6 km wide crossings. The project is expected to be com pleted shortly.

In order to enhance the capacity utilisation of the Hazira-Bijaipur-Jagdishpur pipeline and to meet the requirements of various consumers in Sonepat, Bahadurgarh and Sikandarabad areas and of Maruti Udyog Ltd., the GAIL is laying gas pipelines in and around Delhi at a cost of Rs. 41 crores. The first state clearance for the Bombay City Gas distribution project was given by the Government in December 1990 and the GAIL sub-

nitted a feasibility report to the Government in April 1991. The second stage approval from the PIB is awaited. This project will be a joint venture with the Government of Maharashtra and a foreign gas company. The project cost is estimated at Rs. 43 crores.

The GAIL had raised its gas sales from 2,604 million cubic metres in 1989-90 and 1,320 million cubic metres in 1988-89 to 3,179 million cubic metres in 1990-91. Its profit for 1990-91 amounting to Rs. 25.17 crores showed a slight increase over 1989-90. There was a 22 per cent increase in the internal generation of cash during 1990-91 to Rs. 195 crores. The GAIL hopes that if the current pace of its growth could be sustained, its internal cash generation during the Eighth Plan would be well over Rs. 2,500 crores which could support its wide-ranging investment programmes.

T.P.S. RAJAN

(Source: *Assocham Parliament Digest* and *Hindu Annual Survey 1992*).

CHEMARENA

S.L. VENKITESWARAN

Ethyl alcohol controls continue

After the recent review of the central controls over molasses and ethyl alcohol with a view towards liberalisations and free trade, there is status quo for the present except that "thrust" areas for exports will be on chemicals derived from ethyl alcohol and not molasses or ethyl alcohol itself. The fall-out of decontrol of these two basic raw materials could have been serious but it was realised that Government of India's action would not make much difference — as many State Governments have their own legislation on control over molasses and ethyl alcohol — this is a constitutional right from their revenue and prohibition interests. The centre's control over molasses is under the provisions of the I(D&R) Act and provides the framework for the states to promote industrial uses of both. Now there could be a question of the validity of the Central Government Price Control Order on ethyl alcohol since this item itself is removed from the list of items over which I (D&R) Act is applicable.

The problems of ineffective utilisation of molasses and ethyl alcohol continues to haunt the states. In Maharashtra there is a cut for industrial users in spite of surplus and overflowing warehouses. There is the concern of the control authorities to see that there are adequate stocks to meet the very large requirements of the new project of S.M. Dyechem to make ethylene oxide and MEG. But it is certainly not right to effect a cut on present consumers to provide for a future consumer whose plant is due to start only at the end of the year when the next sugar season will be in full swing. It is questionable whether somewhat reduced storage capacity should be treated as a fault of the alcohol producer or user when they invariably suffer only due to poor planning of distribution. Be that as it may a mistaken notion is that the present ethyl alcohol producers are inefficient and lose 40 to 50 litres of ethyl alcohol on every tonne of molasses. Actually most of them work at accepted efficiency levels and this is only up to 7% less than what is claimed for the continuous fermentation systems — say a possible maximum extra 20 litres per tonne of molasses of the usual 40% fermentable sugars variety. There is need to pull up the few plants which are working at low efficiency levels and not to condemn the industry as inefficient.

It is time that more attention is paid to the industrial use side of ethyl alcohol and ensure that all the major users get a fair deal and no one is discriminated against. The "surplus" states are presently only U.P. and Tamil Nadu as Maharashtra has a Rs. 350 crore project expected to mop up all of present surplus.

Propylene oxide scenario in U.S.

The US market for propylene oxide is sluggish and attempts are for cost reduction to keep up. New technologies are making an advent as well as new producers with total capacity exceeding the demand of mid-nineties.

The leader in U.S. (and some parts of the world) is Arco Chemicals who started with their indirect oxidation technology using peroxides and ending up with parallel co-products — t-butyl alcohol (TBA) or ethyl benzene. A new plant of this type with styrene co-product (2.2 tonnes per tonne of PO) is to start soon with 500 million lbs of PO. Dow Chemicals, the other leader is still wedded to the chlorhydrin route but with the widest range of polyols to complement their isocyanates production. Now Texas chemical is to enter the race with the peroxide oxidation route and co-product MTBE. Dow have problems in costs due to uncertain returns on caustic soda and is shifting to lime where feasible as they have a big market for by-product calcium chloride. This may offset costs to some extent. The capacity and share of these three are given in table below.

	mill. lbs.	Process
Arco Chemicals	1213	Peroxide via iso-butylene
	1100	Peroxide via ethyl benzene
Dow Chemical	1100	Chlorhydrin
	450	Chlorhydrin
Texaco Chemical	400	Peroxide via iso-butylene)

The economies depend on many factors for producers linked to upstream and downstream products. Capacity utilisation at 85% now is likely to decline sharply when the newer capacity (included in the above) comes on stream.

Urethane polyols figures in both rigid and flexible polyurethane while propylene glycols has its range of uses as solvent, for unsaturated polyesters and reinforced plastics. For Arco, the expectation is that PO demand will grow 4% a year and of styrene 3% worldwide for the coming year; the choice of peroxidation with isobutane is appropriate for a party interlinked to MTBE and own sources of C4s. TBA has also potential as gasoline component in view of new US regulations. There is a move to market propylene oxide as an anti-freeze component in place of ethylene glycol. Arco is trying areas of application such as for conversion to but diols. Arco has to face the styrene market — over tw of this for every tonne of PO — but expect that they h only a small share of the 35 billion lbs. market.

The European market is not more healthy but A Pacific region has shown potential. India with its parallel plants of small capacity sharing propylene chlorine has serious market problems which could relieved to some extent when the GNFC project for goes on stream in 2 to 3 years. Strangely enough G ernment seems it fit to approve technology tie-up fo third producer. Both Dow and Arco are global play and our liberalisation regimen may upset the prospe of the small Indian producers. (Ref. *C.E. N*

Anti-Cancer drug — Taxol

The recent discovery of the value of a chemical from the bark of the Pacific Yew tree of USA (a reference was made earlier in these columns) termed *Taxol* has led to systematic efforts for recovery. Bristol Myers-Squibb have been entrusted with recovery of the drug from bark, jointly with NCL. A Pacific Yew Act 1991 has been enacted to ensure that the trees are properly managed and maintained by Government. *Taxol* has been given approval as "investigative new drug" but quantities have to rise substantially for the extensive trials. Production is expected to rise dramatically this year to 16 kgm of formulations. Advanced ovarian cancer is the target for immediate trials. The harvesting of the bark will be the only effective source. Alternate sources of gettin through biosynthesis, or partial synthesis or other rela plant material, tissue culture etc. are being studie

Commercial production from bark may be possibl 2 years. Other yew trees and bushes are also likely be the base. Meanwhile Rhone Poulenc-Roner clai to have a *Taxol* analogue, *Taxotera* for which clini trials show promise.

In India a programme for recovering an anti-canc drug from periwinkle is being mooted — as an exp oriented project.

Perkin Medal for zeolites discoverer

The most important award for applied chemistry in USA for 1992 goes to Dr. Edith Flanigen for her work and developments in the field of zeolites — aluminophosphates and silico phosphate molecular sieves — a new class of materials, microporous crystalline molecules of the type of synthetic zeolites. These have revolutionised a section of chemical processing in the role of shape selective catalysts. There are over two hundred structures of this group and their catalytic activity is gaining more prominance.

Dr. Flanigen worked at Union Carbide Linde Division — later as part of UOP subsidiary of Allied Signal. Her contributions are in finding new ways to make synthetic zeolites — of general formula, $M_{2/n}Al_3O_2.xSiO_2\ vH_2O$ — M being an alkaline metal and n it's oxidation number. The general method was to heat aqueous alumino sil gels at 110-450°C and Flanigen was able to evol methods for large scale production. Metal ions as te plates around which the structures could be built p vided for wider range of activity. As an allied line, process for "emeralds" from various metallic oxides we also evolved. An acid extraction of the molecule p vided a large pore variant and other structures. A wic variety of "template" molecules—amines and tetra alk ammonium salts — further extended the application

Today, the zeolites provide a major area of cataly processes and separations in the field of petr processes. The important area is aromatic separatio and catalytic activity with perhaps the conversion methanol to gasoline hydrocarbons being a landma

FRANKLY SPEAKING: by Dr. O.P. KHARBANDA

Business and the Environment

As a sign of changing times, Financial Times (London) have a regular weekly half-page devoted to the above subject. Three of the recent instalments (December 4 11 & 18, 1992), authored respectively by Clive Cookson, Peter Knight and Richard Evans, are concerned with the UK water industry. These are very relevant to our scenario and i give you here a summary of these. Just to get a 'flavour' of the subject, the three titles are:

The thirst must be quenched
Waste tap must be turned off
An uneasy relationship

The first article looks at environmental challenges facing the UK water industry and examines investment for a clean supply. This is estimated at 28 billion pounds to the year 2000, about 38 per cent is for clean water and the rest for sewerage and waste water treatment to reduce pollution of beaches, lakes and rivers. The three most important steps in conventional water treatment are: clarification, filtration and disinfection by chlorination. The 'advanced water treatment plant' at Kempton Park works south-west of London, includes ozone treatment followed by granular activated carbon.

Neither of these is novel but their combination with traditional sand filters is new. It is known that use of chlorine does pose a slight health risk (organo-chlorine compounds are carcinogenic), but such hypothetical slight risk is considered preferable to the certain risk of infectious diseases with unchlorinated supplies. But strangely some parts of Europe, notably Amsterdam, have been brave enough to dispense with routine chlorination. This article refutes the claim that the UK is the 'dirty man of Europe'.

The second article looks at industry's efforts to reduce the flow of effluents, e.g., a Courtaulds Textile plant has halved its water consumption through strict water and effluent management and this certainly makes environmental and business sense. Also substituting formic acid for acetic has affected considerable savings. Some of the bigger companies have initiated in-process recycling, but the progress is slow and investment cycle is long — 10-15 years. Laws are getting stricter and companies have two options to comply with these and arrest rising costs; make less waste and use better technology to re-use waste that cannot be avoided.

But this requires a change in thinking and which is not easy. This is indeed a growth industry, the market for industrial waste-water treatment in the UK is estimated at over 1 billion pounds by 1995, and perhaps 35 billion worldwide. Innovations are resulting from newer technologies; membranes; biotechnology; information technology and energy treatments using electrons. Real need, however, is to 'bolt together' these new technologies.

The third and the last of this series assesses the impact of the regulaters on this 'privatised monopoly;. This industry is under pressure from all sides; customers complaining of the ever escalating charges; pressure from the ECC to achieve higher environmental standards and last but not the least the regulators who represent both. The host of agencies concerned with this subject in the UK, apart from local authorities, include:

Monopolies and Mergers Commission; Secretary of State DoE; Ministry of Agriculture; National Rivers Authority (NRA); Office of Water Services; Drinking Water Inspectorate; and HM Inspectors of Pollution.

Regulation are bound to get together. A recent document by NRA shows that in recent years there has been 'a real and significant deterioration'. Of course, NRA are not concerned with the financial state of the companies, let alone who pays for the work that it insists on. This dilemma is well paraphrased by Roy Watts, Chairman of Thames Water, the largest of the 10 privatised companies:

> We need to get back to basics ... there must be responsible maximum freedom to manage, a comprehensive and searching long term reivew ... and severe penalties for failure to perform. We're in danger of tinkering with the engine before we've driven the car.

It is not sensible to make an enemy of the regulator, specially in an industry which is in the forefront of the public eye. Politics and public opinion are clearly on the side of the (poor) consumer as indeed they ought to be!

Dr. Kharbanda, is a visiting professor and an author of repute. His recent title: COMPANY CULTURE: IT'S ROLE IN AN INDUSTRIAL SOCIETY (IMDS 1991). Available from Vivek Enterprises, 5 S.K. Barodawalla Marg, Bombay - 400 026.

MRL's Hexane plant inaugurated

The Rs. 10 crore Hexane plant of Madras Refineries Limited (MRL), was inaugurated by his Excellency **Dr. Bhisma Narain Singh,** Governor of Tamil Nadu, at MRL premies in Madras on May 19.

At a colourful function, the Governor pressed a button to inaugurate the Hexane plant. In his inaugural address, the Governor commended the excellent performance of the company over the years and attributed it to the technological excellence, committed manpower and human resource management prevailing in MRL. "MRL's performance is a good example of how public sector undertakings can do well contrary to the general impression that public sector undertakings are a drain on the country's economy", the Governor added.

Presiding over the function, **Mr. H. Krishnamurthy,** Chairman and Managing Director, MRL, pointed out that for the past 24 years, MRL has been consistently maintaining a very good track record in its performance and at the same time growing and diversifying steadily. He recalled that while laying the Foundation Stone of MRL on June 6, 1967, Late Prime Minister **Smt. Indira Gandhi** described it as a Mother unit and this prophecy has come true as a large number of petro-chemicals units at Manali are supplied with feedstocks by MRL today.

Mr. C. Ramachandran, Secretary to Government of Tamil Nadu, Industries Department, in his special address, recalled his close association with MRL right from its inception. **Mr. N. Selvaraju,** President, Madras Refineries Employees' Union and **Mr. V.K. Gopinath,** President, Madras Refineries Officers Association, were felicitated on the occassion. At the outset, **Mr. S. Ramalingam,** Director (Operations), welcomed the gathering, **Mr. P. Sundaresan,** Director (Finance), proposed a vote of thanks.

The project

In order to meet the growing demand of Food Grade Hexane, MRL has set up the 36,000 KL per annum hexane plant at a cost of Rs. 10 crores. The hexane plant consists of a hexane recovery unit, hexane treatment unit and hexane loading facilities.

MRL has facilities to manufacture light straight run gasoline (LSRG), the raw material for hexane, from both imported and indigenous crudes. Thus hexane will be manufactured at MRL at an economical cost. MRL has also installed two storage tanks of 1,000 KL capacity each.

The necessary process design and technical know-how have been provided by M/s. Engineers India Limited in collaboration with M/s. Indian Institute of Petroleum, Dehradun. The food grade hexane produced at MRL conforms to all stringent quality standards specified by Bureau of Indian Standards.

Besides, MRL has already obtained ISI Certification mark for its Food Grade Hexane.

Food grade hexane is a petroleum solvent used in a host of industries ranging from edible oil, pharmaceuticals, rubber, paints, perfumes and plastics. It is estimated that the demand for hexane in the country, arising from about 400 units which is currently around 105,000 kilo litres per annum, would grow steadily at a rate of about 15 per cent per annum.

The Southern Region comprising of 130 units accounts for nearly 35 per cent of the country's demand. Besides MRL, food grade hexane is also being manufactured by HPCL and BPCL at Bombay.

When MRL commences marketing of its food grade hexane, it would cater fully to the solvent extraction units located in Tamil Nadu, Pondicherry and Kerala and partially (50 per cent) to the Units in Andhra Pradesh and Karnataka. Owing to the proximity of MRL to the units, these units would enjoy considerable savings in transportation costs. About 125 customers have registered their hexane requirements with MRL. MRL may also consider exporting surplus hexane to the South East Asian countries.

BARODA NITROXY PLANNING INDUSTRIAL GAS UNIT

Baroda Nitroxy Limited, is setting up a project to manufacture liquid and gaseous oxygen nitrogen and acetylene at 16 km from Baroda near village Manjusar, Tai Savli, a notified backward area.

The products of the company have wide applications in industries like chemicals, pharmaceuticals, dairy and food industries and medical oxygen in hospitals. The Rs. 600 lakh project out of which Rs. 230 lakhs will be offered to public, is promoted by **Mr. Suresh Patel, Mr. Shankarbhai Patel, Mr. Navin Dalmia** and **Dr. Anand Mehr.**

DELICENSED SECTOR: LIs TO BE TREATED AS LETTERS OF PERMISSION

All valid letters of intent issued under the scheme of 100 per cent Export-Oriented Units (EOUs) prior to July 25 last year for the industries now delicensed will be automatically deemded to have been converted into letters of permission.

The letters of permission will be subject to the same terms and conditions as laid in the letters of intent, it was officially announced on May 19. The validity period of these deemed converted letters of permission will be three years from the date of issue of the letters of intent. The industrial undertakings will be required to commence production within the validity period.

300 tpa butyl acetate plant at Ankleshwar

Ultrafine Aromatics Ltd., a member of the GoodEarth group, has launched a Rs. 850 lakh project that will, by December this year, increase its current production capacity substantially and add two export-directed products to its range.

The company is currently manufacturing 300 tonnes per annum (TPA) of butyl acetate and the expansion will boost this capacity almost seven times, to 2,000 tpa. At the same time, the company will also begin production of nitro benzene and acetanilde, both of which are in demand overseas. At full capacity, the company will be able to produce 3,000 tpa of nitro benzene and 800 tpa of acetanilde.

The company proposes to export its entire production of acetanilde, while nitro benzene will be offered in both domestic and international markets. Of the total production of nitro benzene one-third will be slated for captive consumption, as GoodEarth Organic (India) Limited — also a member of the Good-Earth group — will take up 1,000 tpa of this product.

The company is locating this project on a 20,800 sq.metre plot bearing No. 3710, it has acquired at GIDC, Ankleshwar, and work at the site is expected to be completed in September 1992.

TOSHNIWAL AGROCHEM STARTS PRODUCTION OF DYE INTERMEDIATES

The first phase of Toshniwal Agrochem at Tarapur, near Bombay, costing Rs. 152.50 lakh has gone into production according to **Mr. S.S. Toshniwal,** Managing Director. The first phase is to manufacture fast bases like fast red B base, fast scarlet GP base, fast bordeaux, GP base and intermediates like ortho anisidine.

The company has now taken up the second phase for the manufacture of dye intermediates and agrochemicals at a cost of Rs. 965.50 lakh. The commercial production of the second phase is slated for February, 1993. Thus, the total cost of the two phases is Rs. 11.18 crores.

The capacity of dyes (fast base) is 600 tonnes, intermediates 1,200 tonnes and agrochemicals 150 tonnes per annum. Dye intermediates are mainly used for manufacturing dyes widely used in the textile industry. There is substantial export scope for these products in developed countries like Europe and US. Agrochemicals are largely used as insecticides and pesticides by farmers and have wide application for cotton crops, fruits and vegetables etc.

To part finance the second phase of the project, the company is set to go public in the first week of July for raising Rs. 180 lakh by way of 48 lakh equity shares of Rs. 10 each. The equity contribution of the promoters is Rs. 320 lakh, consisting of Rs. 34.50 lakh for the first phase and Rs. 285.50 lakh for the second phase. Out of the public offer, there is reservation for preferential allotment to employees of the company and also to the promoters to the tune of Rs. 24 lakh and to NRIs upto Rs. 192 lakh. The net offer to the public is therefore only Rs. 264 lakh. The company hopes to pay dividend out of its first full year's operations in 1993-94, when the net profit is expected to be Rs. 3.51 crore.

RELIANCE BAGS BRITISH AWARD FOR PLANT SAFETY

Reliance Industries Ltd., has been awarded the British Safety Council's 1991 National Safety Award for its achievements in plant safety at Patalganga petrochemicals complex. This prestigious award was presented to senior Reliance Executives at a function held in London recently.

Thirumalai commissions food/fine chemicals plant

Thirumalai Chemicals Ltd. (TCL), the largest manufacturers and exporter in India of phthalic anhydride and maleic anhydride have successfully commissioned their new food acids and fine chemicals plant at Ranipet in Tamil Nadu. They have commenced production of food, pharma & technical grades of tartaric acid, cream of tartar, rochelle salt, tartar emetic, malic acid (apple acid), fumaric acid and ferrous fumarate USP/BP.

These products are extensively used in processed foods, fruit and vegetable preservation, beverages and fruit drinks, pharmaceuticals and a host of industrial applications. The processes and technology for these products were developed by TCL's Research and Development Group during the last 4 years; the plants were designed and built by TCL's inhouse project engineering group. For most of these products, technology is not available for licensing worldwide. TCL has the distinction of having developed these inhouse, from basics. TCL is also working on developing a range of other fine chemicals.

The above products have been tested and approved by reputed consumers in UK, Germany, USA, Australia, New Zealand, S.E. Asia and India. The products conform to the latest international standards. Most of these products are presently being imported into India. Thirumalai Chemicals Ltd., have set up adequate capacity to meet the entire Indian requirement and to export substantial quantities. The company has received several export orders and enquiries from Europe, Australia, S.E. Asia and the USA. The company has appointed distributors in various countries in Europe and S.E. Asia; market surveys in these countries show significant demand and potential for these products. The company is now working to further expand its capacity in the above food acidulants with a view to exploiting this. The expanded capacity is expected to be ready for commissioning by the middle of next year.

Export performance

The company has during 1991-92 exported about 3,100 MT of phthalic anhydride for a value of US $2 million. The company's new maleic anhydride plant has been working to full installed capacity since January 1992. During the past 4 months the company has exported about 2,400 MT of maleic anhydride, value of about US $2.2 million to West Europe, Australia, USA, Middle East, and S.E. Asia.

TCL is planning exports of over Rs. 20 crore during the current financial year (1992-93) for these products. To achieve this, TCL has launched an intensive marketing effort overseas during the last 6 months.

This effort has already produced excellent results. TCL has appointed distributors in Western Europe, USA, Australia and S.E. Asia to ensure a long term marketing presence in these markets. TCL has also set up a separate internaltional marketing group to effectively pursue this business.

BIG DISTILLERY PLANT ORDER FOR PRAJ COUNSELTECH

Praj Counseltech Pvt. Ltd., a high-tech company which has built 50 distillery plants is to build 35 more units in the next two to three years. Though a private limited company, Praj Counseltech has emerged as the undisputed market leader of fermentation and distillation technology in the country,. its Chairman and Managing Director, **Mr. Pramod Chaudhari,** said. Speaking to reporters, Mr. Chaudhari disclosed that his company has secured six major orders for distillery plants, three each in Tamil Nadu and Maharashtra worth Rs. 15 crores. This was because his company had established a reputation for delivering a package of superhigh quality alcohol at the lowest cost of production, preceded by speedy and timely execution of projects, he added.

ICMA AWARDS 1991

The Indian Chemical Manufacturers Association invites nominations on or before Saturday the 20th June 1992 for the following Awards:

* I.C.M.A. Acharya P.C. Ray award for Development of Technology Indigenously
* I.C.M.A. Award for Process Design and Engineering of Chemicals Plants
* I.C.M.A. Award for Novel and Complex Technology for The First Time in India having a widespread impact on chemical industry and economy
* I.C.M.A Award for Environmental Control Strategies and Safety in Chemical Plants
* I.C.M.A. Award for Novel Energy Conservation and Integration Programme in Chemical Plants
* I.C.M.A. Award for Export of Chemical Products/Chemicals Plant/Engineering Services Rendered overseas
* I.C.M.A. Award for Innovative and Purposeful Programmes for Social Progress.

For all the Awards, chemical industry will be taken to embrace any of the items manufactured in the chemical sector including organic and inorganic chemicals, pharmaceuticals, dyestuffs, fertilisers, pesticides, man-made fibres, speciality chemical or other chemical products. To be eligible, nominees need not be members of I.C.M.A., and the industrial unit may be either in the Public or in the Private Sector.

Further details and Forms of Nominations could be had from the offices of the Association at Bombay, Delhi and Calcutta.

Process for metal recovery developed at CSIR laboratory

With the gradual increase in demand for non-ferrous metals, it is now worthwhile to recover these from different kinds of industrial wastes, viz., brass dross, zinc dross, mixed scraps, spent catalysts, grinding dust, flue dust, sludge, and slags.

For economic processing of these materials in small/medium scale, hydrometallurgical route is preferred over other techniques because of its simplicity, convenience, and product quality. Since most of the industrial wastes are very rich in metal values (20-90 per cent) processing through leaching, purification and electrowinning steps are economical. The Hydro and Electrometallurgy division of Regional Research Laboratory, Bhubaneswar, a constituent of the Council for Scientific & Industrial Research (CSIR), has developed expertise for the treatment of such wastes in bench/small/large scales, as per the requirement, for the recovery of metals from ore/minerals/industrial wastes, etc. Several processes have been developed through leaching, solvent extraction, purification and electrowinning route. Mainly electrolyte grade metals (>99.9% pure) viz., Cu, Zn, Co, Ni, Cr, etc., can be produced through these processes, with options to produce pure salts of these metals at lower capital cost. The laboratory has full facilities to test hydrometallurgical processes, through leaching (including bio and pressure leaching), solvent extraction, and electrowinning for production of metals at 100 kg/day scale in its pilot plant. Based on the data, the laboratory can prepare know-how, basic process package, with material balance, equipments, sizing requirement and specifications etc.

DRILLING MUDS EXPORTED TO SYRIA, JORDAN

M/s. Kalpana Chemicals Private Limited, a Hyderabad based unit has bagged prestigeous export orders for export of Drilling Mud Chemicals through a joint effort with The Minerals & Metals Trading Corporation of India Limited.

Two orders for export of Chrome Lignite to Syria valued at US $89250 and one order for export of CMC to Jordan valued at US $130300 has been bagged by the company. The first consignment was been shipped on May 20.

M/s. Kalpana Chemicals Pvt. Ltd., is expecting more export orders for Drilling Mud Chemicals which were developed entirely based on indigenous technology developed by their own R&D which is also recognised by Government of India.

Menthol exports to US see 100% growth

After two years of relative stagnation, India has achieved a major breakthrough in the lucrative American market for menthol. According to information received from the United States Department of Agriculture (USDA) the value of menthol imported from India during 1991 was 100 per cent more than that in previous year.

The US happens to be the single largest market for essential oils (like mint oils, peppermint oil, spearmint oil), citrus oils (like orange oil, lemon oil, lime oil), menthol, etc. Essential oils are obtained from natural raw materials by distillation or through a mechanical pressing process. These oils are widely used in perfumery, cosmetic and pharmaceutical products. They are also used to flavour food and soft drinks.

Mint oils are widely used in chewing gum, toothpaste, mouthwashes and in a wide variety of confectionery and pharmaceutical products. Citrus oils are widely used by the soft drink industry as well as to flavour confectionery and food products. Aggregate US imports of essential oils were at record levels in 1991, totalling \$154.5 million, compared with 1990 imports of \$150.8 million and \$132.4 million in 1989. In case of menthol, however, US imports declined marginally by 2.5 per cent to 1,374 tonnes valued at \$27.9 million.

Major origins for menthol are Brazil, China, Japan and of late Paraguay and Germany. It is reported that Brazil and Paraguayan menthol is highly regarded for its type and high quality. It thus commands a premium price on world markets.

According to USDA sources, Indian menthol is of a different type and cannot be directly substituted in many cases. Indian efforts in the direction of improved cultivation have attracted wide attention. Planting of a new mint variety called *shivalk* has increased. The new variety has not only improved menthol quality, but also yields higher quantities of oil.

American buyers now recognise that India has been working on improving processing methods. Moreover, Indian exporters are utilising more refrigeration in shipping to keep the menthol crystals from fusing in the tropical climate. The tobacco industry accounts for about half of the US market for menthol, with the cosmetic and pharmaceutical segments taking most of the balance.

The success of Indian menthol exports to the US has attracted the attention of many. Several potential entrants from India are seriously examining the pattern of business. Indian menthol prices too were lower at \$6.29-6.49 per pound, compared with \$7.50-8.00 in April 1991. However, synthetic menthol prices have firmed somewhat to \$11, compared with \$9-10 a year ago.

GNFC EXPORTS METHANOL TO CHINA

India which hitherto had been a net importer of methanol became its exporter when the first consignment of 5,000 tonnes bound for China moved out from Gujarat Narmada Valley Fertiliser Company Ltd. (GNFC), Bharuch, on May 16.

Mr. Prof. P.J. Kurien, Union Minister of State for Industries, flagged off the consignment. **Mr. Shashikant Lakhani,** Gujarat's Industries Minister, **Mr. H.K. Khan,** Chairman of GNFC and adviser to the Chief Minister, were also present. Commending the efforts of GNFC, Prof. Kurien said that not only had it commissioned the project last year but had also achieved a 100% capacity utilisation, producing 100,000 tonnes of methanol.

Mr. Khan appraised the Minister of GNFC's forward integration plans and said the company proposed to manufacture acetic acid based on methanol and aniline projects based on nitric acid. **Mr. K.G. Ramanathan,** Managing Director of GNFC, said the company planned to export 25,000 tonnes of methanol.

US IMPORTS OF MENTHOL

(Qty: tons, Value: Million $)

Country	1989		1990		1991	
	Qty.	Value	Qty.	Value	Qty.	Value
Brazil	264	5.1	92	3.6	104	4.3
China	444	8.1	357	6.9	328	5.6
Germany	15	0.2	112	0.6	148	0.9
India	137	2.5	138	2.3	326	4.6
Japan	215	3.0	248	3.3	132	2.2
Paraguay	26	1.0	295	13.2	234	8.6
Others	130	2.0	165	3.5	102	1.7
Total	1231	21.9	1407	33.4	1374	27.9

E. Merck may enter pigments

E. Merck (India) is considering diversification into pigments and other chemicals with a view to reducing its dependence on pharmaceuticals.

Mr. Valerian Crasto, the Managing Director, told *The Economic Times*, that over the years, the company has brought down its dependence on pharmaceuticals from 100 per cent to 55 per cent. It has sunk more than Rs. 22 crores on a brand new formulation plant in Goa which is unable to earn returns because of the way the government operates the Drug Prices Control Order (DPCO). It has already cut down manufacture of several unremunerative products to reduce losses.

Mr. Crasto said the company was actively considering expansion into chemicals with the help of its overseas partner, E. Merck, Darmstadt. One the products under consideration is mica-based pearl pigments. It has already set up a unit to manufacture aromatic chemicals in Goa, another product line outside price controls. Mr. Crasto said E. Merck had taken a long-term view while proposing to raise overseas equity from 40 to 51 per cent.

Mr. Crasto said it was wrong to think that DPCO in reality controlled drug prices in the country. What it did was to freeze the prices of some 40-odd units in the organised sector which had invested heavily in quality and hygiene. Thousands of units in the small-scale sector, many of whom did not follow good manufacturing practices, were peddling the same drugs at higher prices because they were outside price control, he said.

E. Merck's financial results for the year ended 31 December 1991 are depressing. Sales during the year increased by 14.1% over the previous year to touch Rs. 96.02 crores. Despite the higher turnover, the company suffered a loss of Rs. 2.2 crores as against a profit before tax of Rs. 2.3 crores achieved in the last year. "Although the significant reason for this year's deficit is due to large investments made by the company on new projects in Goa and its consequent impact of higher burden of interest and depreciation, the vital factor that has affected the working results is the unfair treatment accorded by the government to a segment of the pharmaceutical industry in granting end prices of drug formulations", the company maintained.

NO REVAMP OF STC, MMTC

The Commerce Ministry described as 'baseless' some reports that it was reorganising the State Trading Corporation (STC), the Minerals and Metals Trading Corporation (MMTC) and the Project and Equipment Corporation (PEC) on account of decanalisation of various items.

ONGC seeks one-year credit for supplies

Strapped for funds, Oil and Natural Gas Commission (ONGC) according to a report in *The Financial Express*, has inserted a new clause in the already floated global tenders for performance chemicals, asking the suppliers/bidders to give credit for more than one year.

The one year credit will be taken for comparative evaluation between foreign bidders and local manufacturers. The bids will now be evaluated on the basis of the market exchange rate prevailing in the month of March, according to industry sources. Earlier, the tenders were such that the ONGC used to pay 100 per cent after the chemical was despatched by the supplier. ONGC has asked the bidders to requote the prices in the tenders, sources added.

The new clause introduced by ONGC has come as a surprise to the local manufacturers trying to compete with the giant international bidders. Indigenous manufacturers allege that the one year credit facility would not allow the Indian manufacturer anywhere in the entire gambit of floating tenders, what with the interest rate in the country prevailing at more than 22 per cent as against 7 per cent in international market.

Even the price preference formula of 35 per cent to the indigenous supplier is reportedly not enough. In fact, there is no preference at all, sources claim. The local manufacturers have to pay octroi on raw materials purchased indigenously, 1.25 per cent turnover tax on selling prices, high cost of fuel and energy as well as higher packing cost of the chemical. Apart from this, the local bidders also stand to lose the tender as the price quoted by them includes the 25 per cent Gulf surcharge levied by the Government.

Chemical suppliers also point out that the prices of various essential indigenous inputs for oilfield chemicals viz. ethylene oxide (EO) and solvents is much higher than the international prices of similar chemicals. The price of EO in the local market is on an average of Rs. 44,667 per tonne, with Indian Petrochemical Corporation Ltd. (IPCL), charging Rs. 43,000 per tonnes, NOCIL Rs. 40,000 per tonnes and Reliance Petrochemicals Ltd. (RPL), Rs. 43,000 per tonnes. EO is available at a steady price of US $1,042 per tonne or DM 1,325 per tonnes. The Indian manufacturers of EO derivatives cannot avail of benefits of cheaper imported materials as it is an explosive and hazardous gas and thus not an importable item.

ONGC officials point out that if the tender is not opened, then it can introduce any clause and the suppliers could change their tenders accordingly. This system is used to evaluate a tender if two bidders have quoted low prices. In such cases, the tenders would be given to the lowest bidder who has given a better financial package such as giving credit facility, ONGC official added.

Apart from this, the domestic market is also flooded with underinvoiced products, sources point out. Diethanolamine, a chemical used for treating gas, is highly underinvoiced with c.i.f price ranging from Rs. 19.55 per kg at Madras port to Rs. 27.80 per kg, as against the price of Rs. 60 per kg charged by local manufacturer.

About 200 tonnes of chemical is imported every month against the total demand of 300 tpm in the country. Sources claim that there is heavy dumping of specialised chemicals. The domestic price of the chemical in USA is $1,300 per tonnes as against the c.i.f value of $850 per tonne for the same.

Meanwhile, about 40 chemical manufacturers of oilfield and refining chemicals have formed an association — Oilfield & Refining Chemicals Manufacturers Association of India (ORCMAI).

Penicillin shortage forces closure of drug units

Several units manufacturing antibiotics have been forced to discontinue operations because of non-availability of penicillin says a report in *The Economic Times.*

A leading Gujarat-based manufacturer of semi-synthetic penicillin derivatives said his plant has not been operating for over a week becasue of non-availability of the raw material. Those units which continue to operate report capacity utilisation of around 40 per cent. Industry sources predict that a shortage of widely, consumed antibiotics like ampicillin and amoxycillin is around the corner unless the government took corrective action.

While it is common for public sector units to seek full payment before supplying goods, the leading public sector enterprise Indian Drugs and Pharmaceuticals Ltd. (IDPL), has told its consumers that it will make delivery only within 60 days after receiving full payment. Several consumers reported receiving written communication to this effect.

To help the ailing PSUs, the government had changed consumption norms of imported to indigenous penicillin for drug units to 50:50 in early 1991.

The government also allowed two upward price revision to IDPL and Hindustan Antibiotics Ltd., the two penicillin producers. Because of inadequate supplies from the two units; penicillin consumers have not been getting import licences because import licences are issued on the basis of lifting equal quantity from Indian companies.

Drug manufacturers' problems have been compounded by the fact that the government notified prices for antibiotics are based on the assumption of 80 to 90% capacity utilisation, whereas the capacity utilisation has come down to 40 per cent, according to producers. Their hopes of inclusion of penicillin in the list of drugs which will be allowed to be imported at the official exchange rate has been belied and some producers have already applied for price revision based on the market rate.

An industry delegation had called on the concerned officials in New Delhi recently, to represent the problems of the industry. While department officials fully appreciated the increased cost of drug manufacture following import of intermediates at market rate, no decision is forthcoming because any decision will have to involve other key Ministries like Finance.

There is no mechanism in the Drug Price Control Order to accommodate cost increases based on exchange rate variations.

CULTIVATION OF MEDICINAL PLANTS BEING NEGLECTED

At least half of the 1,200 categories of aromatic plants, and medicinal plants found in the country are not used as they are not cultivated because of lack of knowledge among farmers about their importance in allopathic drugs.

Informing this to reporters at Pune recently **Dr. B.P. Joshi,** consultant with a monthly magazine, *Baliraja,* devoted to modern trends in agricultural practices, said there is an increasing scope of these plants in the world market compounded with the fact that the weather conditions in the country were most suitable for their cultivation.

Almost 39 per cent of allopathic drugs manufactured make use of medicinal plants, apart from their wide-spread use in ayurvedic medicines, he said.

IV fluids plant coming up near Madras

A Rs. 13.50 crore venture has been promoted by Unicorn Pharmaceuticals (India) Ltd. for the manufacture of large volume paranterals (I.V. fluids) in fully automatic form-fill sealing (FFS) machines. Located at Kunnam village in Chengai-MGR district, 50 km from Madras, the plant is ready to start production.

The company has already commenced marketing of specialised formulations. It also intends to market advanced homeopathic therapy imported from Germany for cancer treatment. Later a bottling plant is to be set up to manufacture the therapy. FFS machines are supplied by Rommeleg, AG, Switzerland and other equipments are supplied by local suppliers. Technology for I.V. fluids are provided by **Dr. Ramamurthy,** a NRI Director of the Company from the US. He is also helping the plant to get US FDA approval to tap the export market in the US and Canada.

The company also intends to manufacture and export baby creams, lotions and ointments in technical tie-up with **Dr. Med Skelnar** Bio Produkte GmbH Bochum, Germany. There is also buy back arrangement with marketing rights for Bangladesh, Pakistan, Nepal and Sri Lanka. There is also a plan to produce bulk drug based on indigenous technology. The term loan portion of Rs. 9 crore is provided by ANZ Grindlays. Promoters are contributing Rs. 1.65 crores while the capital subsidy comes to Rs. 15 lakhs.

The Rs. 2.7 crore public issue will be offered shortly with SEBI approval. The company envisages no difficulty in achieving the full capacity of 67 lakh bottles of I.V. fluids per annum given the estimated demand of 1742 lakh bottles of which the organised sector claims a share of 1139 lakh bottles. The company hopes to achieve a turnover of Rs. 15 crores in the first full year of operation of which 40 per cent will be export earnings. It is entering into a separate buy back arrangement with Varhaaeln GmbH of Germany for exporting the products. The company is promoted by professionals with 15 years of experience in the pharmaceutical field, including the marketing of certain unique products. **Suresh P. Prabhu,** Chartered Accountant and Chairman of Saraswat Co-operative Bank, Bombay is the Chairman of the company.

MORE MINI-GROWTH CENTRES PLANNED

The Government has stepped up the allocation for establishing mini-growth centres in the current financial year to promote small scale and tiny industries in the country. According to Small Scale Industries Secretary, **Mr. S.L. Kapur,** the allocation had been stepped up from a token provision of Rs. 2 crore to Rs. 30 crores. He said the government had planned to set up 187 mini-growth centres in all the identified backward regions in the country during the Eighth Five Year Plan. Called the infrastructural development for small scale industries in rural areas, the scheme is to be funded jointly by the Union and State Governments.

KUWAIT, DUBAI OFFER GOOD SCOPE FOR LEATHER ITEMS

There is a considerable export potential for increasing exports of leather items like shoes and bags in Kuwait and Dubai, according to a delegation which visited these countries recently. With the government's emphasis on promotion of value-added exports, intensive effects to these comparatively new markets for leather products could yield encouraging results, the delegation has come to the conclusion after a four-day visit to Kuwait and one-day discussion in Dubai. The delegation, led by **Mrs. Rita Singh,** Executie President, Indian Chamber of Leather Industry, included **Mr. K.C. Ganjwal,** Director, Ministry of Commerce, and exporters.

New drug policy in two months

A decision about the new drug pricing as well as licensing policies will be taken in the next two to three months to resolve uncertainties and problems being faced by the industry currently.

According to Chemicals and Petrochemicals Ministry sources, the delay in announcement of both policies had caused confusion among organised drug manufacturers. They are in a dilemma whether to invest further or not.

Petrochemicals Secretary **Mr. M.S. Gill** said the Ministry was making all possible efforts to announce the policies soon. According to the present situation, there was a need for "watch licensing". The Ministry is encouraging the manufacture of pharmaceutical products at the basic level, he said.

Mr. Gill said the country was bound to accept Dunkels proposed sooner or later but the government must utilise the grace period ranging from five to ten years for encouraging the drug industry to compete in international markets. The government should give incentives to the industry so that manufacturers can face challenges from multinationals.

Expressing satisfaction over the export performance of the industry, Mr. Gill said the industry had achieved an increase of 20 per cent last year. Though the export turnover increased from Rs. 950 crores to about Rs. 1,400 crores, there is big scope for further increase. He said specific incentive measures had been proposed in the new policies for exports, besides research and development to encourage the export of quality product.

Bulk drugs at official forex rates

Mr. Gill said the Ministry had been pressing the Finance Ministry to allow import of bulk drugs and their intermediates at official exchange rate on t[h]e pattern of life saving drugs which ha[ve] been allowed official exchange rate. [If] this was not done, then import du[ty] should be reduced suitably to compe[n]sate for the difference between mark[et] exchange rate and official exchan[ge] rate.

If both official exchange rate a[nd] reduction in import duty was n[ot] allowed by the Finance Ministry, t[he] industry would be forced to hike t[he] drug prices across the board. A[n] increase in the prices of bulk drugs fro[m] 15 to 20 per cent could not be ruled ou[t].

Meanwhile, drug industry source[s] said if the government did not immed[i]ately take a decision on giving compe[n]sation to the manufacturers, they woul[d] be forced to gradually stop productio[n] of controlled drugs as they did after th[e] two stage devaluation of Rupee an[d] resulting delay in the revision of price[s] of controlled items. The governme[nt] will be squarely blamed for the impend[ing] shortages of drugs in the market [if] this facility was not extended to th[e] industry. If the drug manufacturers ha[d] to purchase their foreign exchange fro[m] the market without grant of either req[u]isite pricing freedom or expeditiou[s] price compensation, the new invest[ments] in the core sector are bound t[o] be affected if not fully checked, th[e] industry sources said.

MANAV PHARMA TO SET UP DRUG EOU

Manav Pharma Ltd. is commissio[n]ing a 100 per cent EOU project with tw[o] modern production lines to manufactur[e] a range of anti-bacterial and anti-ulce[r] bulk drugs at G.I.D.C. Estate, Anklesh[war]. The company has a technical col[laboration] with a leading company i[n] Australia for supply of technology an[d] basic engineering. The collaborator[s] have given performance guarantee fo[r] the manufacture of products as pe[r] USP/BP standards.

Pfimex bags Rs. 4 crores export orders

The Hyderabad-based Pfimex International has bagged maiden export orders worth Rs. four crores for formulations from Africa and South East Asia according to **Mr. Girish Bhandari,** Joint Managing Director. Out of these orders, it has already executed orders worth Rs. 1.50 crores during this month. The balance orders will be executed by the end of September 1992.

Pfimex will make further inroads into the export markets after its new project at Sarigam, Gujarat goes into production in September this year. The cost of this project is Rs. 255.48 lakh. This plant will have facilities for the manufacture of tablets, capsules, powders and ointments. The company's plan is to export 25 per cent of its total production.

Apart from this new project, Pfimex has expanded the capacity at its Hyderabad unit and the expanded capacity started production in March. The total cost of the Hyderabad expansion project and the Gujarat project is estimated at Rs. 10.05 crores, including preliminary and pre-operative expenses of Rs. 75 lakh and working capital margin of Rs. 379.60 lakh and the same is being raised by the rupee loan of Rs. 230 lakh, private placement of non-convertible debentures of Rs. 250 lakh and rights issue of 14 per cent fully convertible debentures of Rs. 525 lakh.

The present business of the company involves manufacturing and marketing of pharmaceutical formulations. The company has launched several new products over the years. The main product Becelac, developed by the company in its R & D has carved out a niche for itself in the pharmaceutical industry. Its R and D is recognised by the Government.

The products manufactured by it are mainly vitamins and multi mineral formulations. Latest antibacterial products were added to the list of products and are presently being manufactured in Hyderabad. The products broadly fall into five categories — tablets, capsules, powders, liquids and ointments.

The company expects to finish the current financial year ending September 1992 with a turnover of Rs. 18 crores and a pre-tax profit of Rs. 1.60 crores. With the expanded capacities, the company expects to achieve a turnover of Rs. 28.30 crores and a pre-tax profit of Rs. 2.27 crores in 1992-93. Pfimex has had an uninterrupted dividend record for the last three years, the last dividend being 18 per cent for the year 1990-91. The company went public in July 1990.

IMPROVED YIELD BY TISSUE CULTURE

The production and productivity for small cardamom are expected to go up about six times the current average yield of about 65 kg per hectare because of tissue culture applications. Tissue culture cardamom plants in Kerala, Karnataka, and Tamil Nadu have so far registered an increase of 63 per cent in yield over open pollinated seedlings.

The demonstration projects have been launched by the Department of Biotechnology (DBT) in collaboration with the Spices Board and the Commerce ministry. The issue culture plantlets are supplied by the A. V. Thomas Laboratory, which is associated with the implementation, monitoring and evaluation.

According to DBT, the performance of the tissue culture clones varied with respect to the estimated yield ranging from 127 to 968 kg per hectare depending upon the clones selected and the agro-climatic zones in which they were raised. The mean estimated yield of tissue culture plants is 360 kg per hectare annually as against 226 kg of open pollinated seedlings.

Galaxy Remedies to enter the capital market

Galaxy Remedies Ltd. will enter the capital market with a public issue of 21 lakhs Equity Shares of Rs. 10 each for Cash at Par aggregating to Rs. 210 lakhs in the month of September, 1992. The issue is being made to part finance the Company's plan to expand and diversify in the field of Injectibles, Ointments and certain other OTC products. According to **Mr. Vijay M. Jain,** the Managing Director of the Company, the Company's products under the brand name "Galaxy" are well-established in the market. Galaxy Remedies Limited, was promoted by Mr. Vijay M. Jain with the main object of manufacturing the Pharmaceuticals formulations Cosmetics, Injectibles, etc. for domestic & International markets. Mr. Jain was running the unit as a partnership firm since 1985. In order to expand the activities of the company, he has converted the same into a Public Limited Company. The existing plant is situated at Sarigaon in Balsar District of Gujarat. Promoter Mr. Vijay M. Jain & Co-promoter Mr. S.N. Agarwal have wide experience in industry and adminstration. They are backed by a team of professionals in various fields who will work under the supervision of the Board of Directors. The Board of Directors of the Company include Mr. L.R. Ahuja, Dr. Mukesh Agarwal, Mr. Pradeep Goenka, Mr. P.J. Gupta, Mr. Vishwanatham and Dr. K.J. Kamath.

(Rs. in lakhs)

	1993-94	1994-95	1995-96
Sales	625	730	850
Gross Profit	180	210	240
Profit after tax	110	135	144
Share Capital	350	350	350
E.P.S.	3.17	3.86	4.12

Marketing

Since the promoters are already in the business and the plant is in running condition, the marketing will cause no problem to the Company. However, with the ambitious expansion plans on the anvil, the Company will widen its network of distributors and dealers. The Company is forming a dedicated team of representatives with a well-trained and professional approach to inform medical practitioners about the additions to the Company's product range.

Prospects

The demand for various pharmaceutical products is increasing constantly. The sale of drugs and pharmaceuticals in India has increased from Rs. 175 crores in the year 1968 to Rs. 3;360 crores in the year 1989-90. The government's dream of 'Health for All' by the year 2000 provides a great scope for this industry. Besides, the social health care and mass medical facilities for the public adopted by the Government will also result in increased demand for various pharmaceuticals. The expanded and modernised plant will be able to exploit the growing market and make reasonable profit to reward the shareholders. The Company will also exploit the export market. Negotiations are under way for marketing of existing products overseas. Besides, the Company has also explored the market for bulk supply to institutions, government and semi-government organisations. The total cost of the expansion-cum-diversification is being put at Rs. 3.85 crores. The promoters will be contributing Rs. 1.40 crores by way of equity, and will seek term loans/lease finance to the extent of Rs. 0.35 crore.

Fertiliser subsidy may be slashed by Rs. 3,000 crore

The Government is planning to reduce the ferliser subsidy by about Rs. 3,000 crore this year. The issue of reduction in fertiliser subsidy is currently being studied by a parliamentary committee but the Government is of the view that a certain reduction in this subsidy will have to be made in any case.

It is also planning to reduce the subsidies on food by hiking the prices of items distributed through the public distribution system (PDS). One of the proposals in this regard is to introduce a dual pricing system even for PDS, by charging a higher price in certain categories of shops.

A hike in foodgrains prices has in any case become due owing to the extra bonus provided by the Government to farmers for increasing procurement by Government agencies this year.

Another proposal is to reduce the subsidies on certain petroleum products like LPG by hiking their prices. The subsidy on LPG last year was estimated at about Rs. 1,000 crores and will go up further this year due to introduction of partial convertibility of the rupee.

Though the Finance Minister has indicated an increase in kerosene prices, it is possible the Government may increase the price of petrol to about Rs. 20 per litre in stages. These steps are being contemplated to meet the International Monetary Fund's conditionalities.

The Government has devised a simple mechanism for reducing the subsidies on bulk items which are imported. Foreign exchange at the official exchange rate of rupee will be available only for import of crude oil, diesel, kerosene, finished fertilisers and certain life saving drugs. For the rest of items, foreign exchange will have to be obtained at the free market rate.

There is, however, a rider to this. The foreign exchange at the official exchange rate will be available only to the extent of provision made in the Foreign Exchange Budget for such imports. Imports over and above provided for in the Foreign Exchange Budget can also be allowed by the Government provided the payment is made at the market rate.

Thus, while part of the requirement of these items can be made at the official exchange rate, part will have to be made at the market rate. This will force the canalising agencies like the Indian Oil Corporation and Minerals and Metals Trading Corporation to increase the selling prices of items imported by them.

WOCKHARDT PLANNING Rs. 100 CRORE EXPORTS IN THREE YEARS

Wockhardt Ltd., the Bombay based Rs. 100-crore health care company, has won the recently announced Chemexil award for export performance in the drugs and pharmaceuticals panel. In the current year Wockhardt export doubled over previous year to over Rs. 10 crores. Wockhardt expects to triple this figure and export Rs. 32 crores worth of products in the current year 1992-93. Wockhardt is amongst the top three companies in the world to manufacture dextropropoxyphene and nearly 70 per cent of its total production is exported to various parts of the world primarily to USA and Western Europe.

Wockhardt's Chairman & Managing Director **Mr. H.F. Khorakiwala**, said that Wockhardt is undertaking a very intensive export drive to increase its exports to nearly Rs. 100 crores in three years time. Wockhardt is expanding its bulk drugs manufacturing facility at Ankleshwar in Gujarat to meet the export demand.

Use of neem-based pesticides up

Revered in India for centuries but largely ignored by the West, the neem tree is now commanding attention in the global search for safer and more effective pesticides. Neem has become the "favourite flora" of Western firms that are now buying tonnes of neem seeds in their attempts to produce neem-based biopesticides, says a report in the US journal *Science*.

The report says a New York-based company recently began distributing Margosan-O, a neem-based pesticide for use in greenhouses, commercial nurseries, forests and homes. Chemicals derived from neem can ward off locusts, gypsy moths, cocokroaches and other insects, some of which cannot be controlled effectively with conventional pesticides. This has aroused widespread commercial interest in neem.

The US National Research Council (NRC) earlier this year released a report entitled 'Neem: A tree to solve the world's problems,' that concluded that neem is probably "the single best source of biopesticides around." The NRC report is intended to encourage entrepreneurs wanting to invest in neem and develop it as a cash crop in third world countries where it grows abundantly, the journal said quoting the NRC study director.

Neem oil contains several chemicals of which the most potent one, Azadirachtin interferes with the reproductive and digestive processes of insects. Acting in a number of subtle ways, neem disrupts insect mating, causes sterility, and decreases gut motility, preventing insects from swallowing.

Tests show that neem products are much safer for other species than are synthetic insecticides. The US Environmental Protection Agency (EPA) in 1985 cleared the use of Margosan-O for non-agricultural uses. Toxicity trials for general pesticide registration are now underway to study the possibility of using Margasan-O on foodcrops. Sales are expected to go up significantly if EPA clears its use on foodcrops, the journal said.

The company is now putting into place a network of neem seed sources so that it can ensure a constant supply of seeds and reduce their price which is now about $300 per tonne, it said.

The work on neem is part of a worldwide quest for biopesticides that will serve as an alternative to synthetic chemical pesticides that have been associated with toxic side effects.

Indian scientists have studied the anti-bacterial and insecticidal properties of neem for decades. But its ability to combat insect pests aroused interest in the West only in early seventies. But researchers now estimate that annual sales of natural insecticides will reach $800 million by 1998 in the US alone.

GOVERNMENT MONITORING PESTICIDE PRICES

The Ministry of Agriculture is enquiring into the prices of widely consumed pesticide formulations which recorded a sharp increase in recent years.

The Directorate of Plant Protection and Quarantine, Ministry of Agriculture, has written to the Delhi-based Pesticides Association of India, calling for data on price movements during 1990, 1991 and 1992 in a prescribed format.

Following are the formulations: BHC, cypermethrin, dimethoate, endosulfan, fenvalerate, methyl parathion, monocrotophos, malathion, phorate, phosphamidon, quinalphos, copper oxychloride, mancozeb, sulphur, thiram, butachlor, isoproturon, aluminium phosphide.

HFC's Haldia unit continuing to languish

Twenty-one years after being sanctioned, the Haldia project of the public sector Hindustan Fertiliser Corporation (HFC) remains jinxed, with employees of the division being dogged by perennial rumours over its ultimate fate.

Leaders of various employees' associations at Haldia allege that the management had intimated them verbally that the salaries of employees would be stopped from June 1 onwards. The General Manager of the Plant, **Mr. S. Satpal**, however, says "we have not received any official notification yet and we do not know what is going to happen".

Rumours of retrenchment, closure of the plant and curtailment of manpower are in vogue in the HFC township. Mr. Satpal is unable to throw any light on the issue and scotch these rumours. "I am equally in the dark, but a decision may be taken soon since too much money has gone down the drain and too much time has flown", he says.

Nearly six years have gone by since commissioning activities were stopped in August 1986 and even after a mammoth investment of more than Rs. 600 crore, the fate of the project hangs in balance. Sanctioned as a project in November 1971 with a total capital investment of Rs. 88.03 crore, including a foreign exchange component of Rs. 29.04 crore, the project cost was revised as many as 13 times between October 1972 and September 1989.

In his report on the Haldia project in September 1991, the Comptroller and Auditor General (CAG) indicated the government for not sanctioning the cost of the projects which had remained 'unproductive so far",

The CAG report also came down heavily on the design deficiencies, technical problems, mismatching of equipment (procured from 13 different countries) and time and cost overruns. Close on its heels, the Committee of Public Sector Undertakings (COPU), in its report in March 1992, criticised the Centre for dilly-dallying on the issue.

"It can definitely be revamped and run, the only thing required being adequate funds and desire on part of the concerned authorities", says Mr. Satpal. The sagging morale of the employees has to be boosted, a sense of confidence and work culture instilled in the employees, who have literally been coming only to collect their pay packets.

"Setting aside their differences", the HFC workmen's union (HFCWU), th HFC Officiers' Association (HFCOA and the HFC Workers and Employees Union (HFCWEU) have recently sub mitted a joint proposal towards opti mal utilisation of the plant and human resources before a comprehensive reha bilitation package could be drawn up The proposal for the revival of th Haldia fertiliser complex would b completed in three phases and entail a expenditure of Rs. 96 crores.

The proposal seeks to restart th nitrophosphate (NP) plant and achiev the production level of 400 tonnes pe day (TPD) in the first phase, to b implemented in eight months at a cos of Rs. 25 crore. Increasing the NP production capacity to 800 TDP, in the nex phase, would require an investment o Rs. 1 crore and accomplished in a year In the final phase, which would necessitate an expenditure of Rs. 70 crore an require 18 months to complete, the ammonia plant could be restarted after essential replacements and modifications.

The three associations see as much "financial justification" in the release of the requisite funds for revitalising the project, as did the nine expert committees, set up between August 1986 and June 1991, by the Centre to look into the technical viability of the project.

Dutch company proposes ethylene terminal at Nhava Sheva

Representatives of Van Ommerand, an international group engaged in chemical storage and transport, has evinced interest in the construction of the ethylene terminal at Nhava Sheva. A team from the company visited the port recently to prepare a feasibility report.

The proposed chemical terminal, estimated to cost about Rs 300 crore, is being conceived as an international transhipment terminal for the servicing of other satellite terminals. Though the planning for the terminal is still at a preliminary stage, an operating scheme is being prepared by a professional consultant for the storage of liquids and gases.

Major ethylene consumer industries like Polyolefins Industries Ltd., Herdillia Chemicals Ltd., Polychem Ltd., Supreme Industries Ltd., and Vinyl Chemicals Ltd., located at the Thane-Belapur belt are likely to benefit from the terminal.

The region is poised to grow into a major petrochemical centre with the commissioning of the Maharashtra Gas Cracker Complex (MGCC) and their expansion plans to manufacture 400,000 MTA of ethylene and other downstream products.

A facility for unloading, storage and distribution of liquid ethylene in and around Nhava Sheva is now being considered a necessity. The distribution of the ethylene through high pressure underground pipelines, will bring the gas to the doorstep of the consumers.

At present, two private-run chemical terminals exist in the country. Both the Reliance terminal at Hazira and Finolex chemical terminal are dedicated to ethylene alone. The proposed chemical terminal at Nhava Sheva will deal only in ethylene initially, but is likely to include propylene and other chemicals at a later stage, which diminish the optimum utilisation of plant capacities.

A buffer stock of ethylene is required because there exist imbalances in operations to the extent of 10 to 15 per cent. The terminal will ensure ethylene supplies for users as a standby in case of a shut down in the gas cracker units.

The project encompasses special facilities for the storage and transport of cryogenic gases like an ethylene storage tank with a capacity of 5,000 MT of liquid gas at a temperature of 104 degrees centigrade.

The terminal will have special ethylene transfer systems like vaporisers and compressors to feed the underground pipeline system. An unloading arm linking the jetty to the storage tank is planned.

HERDILLIA CHEMICALS HIKES DIVIDEND

The directors of Herdillia Chemicals have stepped up the dividened by four per cent to 30 per cent for the year ended March 1992, absorbing Rs. 221 lakhs against Rs. 191 lakhs.

Turnover at Rs. 149 crores was higher than in the previous year but production in 1990-91 was affected by a fire accident and in the current year by severe flooding which suspended operations for about 10 days.

Profitability for the year was only marginally better due to very high inflationary pressure on costs, sporadic raw material shortages, etc. The sales including excise duty and other income amounted to Rs. 151.31 crores against Rs. 115.04 crores and earned a gross profit of Rs. 13.08 crores against Rs. 12.98 crores.

After depreciation (Rs. 262 lakhs against Rs. 227 lakhs) and taxation (Rs. 383 lakhs against Rs. 324 lakhs) and adding prior period adjustment (Rs. 80 lakhs against nil), the net profit amounted to Rs. 743 lakhs against Rs. 747 lakhs. After adding certain adjustments, and adding balance carried forward (Rs. 187 lakhs against Rs. 121 lakhs), the disposable profit amounted to Rs. 960 lakhs against Rs. 878 lakhs.

After the proposed dividend, a Rs. 50 lakh (nil) has been appropriated to debenture redemption reserve, Rs. 500 lakhs (same) to general reserve and balance surplus of Rs. 189 lakhs against Rs. 187 lakhs has been carried forward.

HIL SIGNS MoU WITH GOVERNMENT

Hindustan Insecticides Ltd. (HIL), a public sector undertaking under the Department of Chemicals, has signed a memorandum of understanding (MoU) with the Government.

The MoU envisages increase in turnover by 30 per cent and production by 22 per cent during 1992-93. It is planned to increase the company's share in the agro-pesticides market of the country from 3 per cent to 4 per cent by improving product portfolio, aggressive marketing and improved customer services.

It is also proposed to improve agricultural productivity and public health standards through technological inputs in the pest control industry. The MoU was signed by **Mr. V.K. Majotra,** joint secretary, Department of Chemicals and Petrochemicals, and **Mr. D. Jayaprakash,** Chairman and Managing Director of HIL.

GROWTH IN PETROCHEM INDUSTRY

Reduction in duties, tariffs vital

Capital goods, electronics, and jute industries will be adversely affected during the Eighth Plan period while the fertiliser industry, will be virtually by-passed by the economic liberalisation due to controls on inputs and prices. On the other hand, cement, sugar, textiles and steel industries are poised to do well, according to an assessment made by the Planning Commission.

The medium term prospects of the capital goods sector will be hit by the freedom given to the entrepreneurs to select and import capital equipment and technologies, and its inability to meet global competition. In due course, however, the leading capital goods manufacturers can be expected to update their products and emerge as suppliers of world class capital goods.

The jute industry, according, to the planners, is surviving virtually on oxygen being provided by the Government. The industry has a bleak future unless it takes up modernisation in a big way, concentrates on high value products and diversifies into new areas.

According to the planners, while the petrochemical industry has been delicenced, its growth will be guided to a considerable extent by the reductions in taxes and duties on its products. Prices of most of the petrochemical products in the country are well above the international levels, partly because of high administered prices of inputs and partly because of high rates of taxes.

The fertiliser industry, the planners, feel, will be virtually by-passed by the economic liberalisation in view of the controls on inputs and administered prices of inputs as well as outputs of the industry. In the case of nitrogenous fertiliser, a decision on the pricing policy is imperative.

While the existing system of retention prices and subsidy is leading to increasing burden of subsidy on account of increases in production and costs of inputs unmatched by corresponding increases in the retail prices of fertiliser, adequate private sector initiative is not forthcoming because of lack of a clear-cut policy and freedom to decide the feed stock as well as uncertainty about the returns from investments. From time to time, ad hoc adjustments have been made in the norms for fixation of retention prices, creating considerable apprehensions among the potential investors about the viability of the projects.

In this context, the planners have emphasised the imperative need to finalise the feedstock and fertiliser pricing at the earliest and warned that the country may be heading for increased shortages and dependence on import of nitrogenous fertilisers. The cement industry, it is felt, is internationally competitive and could be expected to record good growth in production as well as exports.

With the focus on increasing per hectare yield of sugarcane, the sugar industry is likely to increase its production and exports substantially. The textile sector has been undergoing a major restructuring. The mills in the organised sector are not able to meet competition from the powerlooms, though spinning continues to be profitable. A number of composite mills have closed down, the mills are increasingly modernising their plants and machinery and devoting greater attention to exports.

Several 100 per cent export oriented units (EOUs) have also comeup. This is seen as a healthy development. This trend is expected to get accelerated and the textile exports are poised for a quantum jump. With improved availability of quality fabrics at competitive prices, the garments industry is also expected to record a healthy growth.

The powerloom sector is likely to further increase its contribution and become the prime supplier of cloth for domestic market. However, the outlook for the handloom sector does not look promising. It will need to switch over to production of high value items and cater to the sophisticated exports market for specialised products. The recent policy changes like delicencing of iron and steel units, are expected to give an impetus to the Indian steel industry to grow freely and also attract the private investment. The initial response of the private sector to these changes appears to be encouraging, the planners feel.

POLYMER PRODUCERS FACE FALL IN SALES

Polymer producers are experiencing a fall in sales, a phenomenon attributed to steep rise in prices and recession in the market for plastic goods. Some small-scale plastic processors are receiving calls from marketing personnel of leading petrochemical companies seeking appointments. "This is something never heard of in this industry which has always been a sellers' market", said a small entrepreneur.

Polymer prices have gone up by an estimated 24 per cent following the financial restructuring in recent months. While the budget did not bring about the expected reduction in import duty, the practice of calculation of the import value at the market rate of dollar and levying of duty on this amount has led to escalation of prices and depressed demand.

International prices have also risen in recent months. All these factors have made plastics the worst hit industry, according to industry observers. The recession has been very evident in the consumer durables sector patronised mostly by the middle class. "Prices of basic necessities have risen, eating into the budget for convenience goods", explained an industrialist.

Tie-up with Bangladesh on gas use likely

India may import natural gas from Bangladesh and, in turn, accept Dhaka's conditions on two proposed gas-based joint ventures between the countries. Officials say that Bangladesh is seeking a buy-back arrangement for four lakh tonnes of sponge iron from a joint venture project proposed to be set up by the Birla Technical Services and the Bangladesh Bengal Development Corporation Ltd. in Chittagong.

It is also seeking an assurance on the adequate supply of limestone from Meghalaya to the Surma Valley for an assured gas suply for a proposed cement joint venture to be set up in Bangladesh. The import of natural gas was one of the items for discussion on the economic agenda during the meeting between Bangladesh Prime Minister **Ms. Khaleda Zia** and **Mr. P.V. Narasimha Rao.**

The proposal to import gas from Bangladesh is being taken up now given the grim domestic scenario. Huge investment planned in the power, fertilisers and petrochemicals sectors have been jinxed following indications from the concerned corporations that no gas may be available for future investments.

While credit for both the joint sector projects in Bangladesh has been lined up from the ADB, little headway has been made so far as India had remained non-committal on the two conditions.

Economic cooperation between the two countries is gaining ground, with Bangladesh having indicated its willingness to export two lakh tonnes of urea to India at a time when the country is facing shortages and importing up to six lakh tonnes from Russia. A Bangladesh delegation is soon visiting New Delhi to firm up the proposal as also any long-term arrangements on the commoditity.

India is also keen on setting up joint ventures in the field of phosphatic fertilisers with Bangladesh. This follows a decision by the Planning Commission to freeze any new capacity addition in this area within the country.

ONGC MAY CUT GAS SUPPLY TO OTHER CONSUMERS

As a sequel to the reduction in supply of gas to the Tata Electric Companies (TEC), the Oil and Natural Gas Commission (ONGC) has sounded other consumers about a possible reduction in supplies.

In a telex message sent on May 23, ONGC has informed its consumers that henceforth, they will be supplied only the committed quantity agreed upon. Most of them have been lifting more gas than their agreed quota. Major consumers are the two refineries, namely BPCL and HPCL, Rashtriya Chemicals and Fertilisers, and Deepak Fertilisers.

However, ONGC officials clarified that reduction in supply to other consumers does not necessarily imply the gas supply cut to TEC will be lesser than announced earlier.

ONGC has recently announced a reduction in gas supply to TEC from the committed quantity of 1.5 mcm per day to 0.5 mcm per day, which had triggered apprehensions that Bombay will experience a daily power shortfall of 500 mw this summer.

Meanwhile, it is unofficially learnt that BPCL and HPCL are likely to increase the supply of LSHS (Low Sulphur Heavy Stock an alternate fuel to gas) to TEC by 200 tonnes to 1,800 tonnes per day. Also, the Maharashtra State Electricity Board (MSEB) is likely to supply an additional 200 mw to TEC. This will considerably ease the situation and the city may not experience more than the usual loadshedding in summer, assured a TEC official.

HPCL SETTING UP Rs. 6 Cr. WATER TREATMENT PLANT

Hindustan Petroleum Corporation Ltd. (HPCL) is setting up a treatment plant for reclamation and recycling of 23 MLD of water per day. According to a press release issued by Batliboi and Co. Ltd., HPCL has entrusted this work to Hydraulic and General Engineers Ltd. (HGE) at a cost of Rs. 6 crores.

National Thermal Power Corporation (NTPC) is putting up a project for reclamation and recycling (after treatment) of 144 MLD of water per day at Ramagundam Super Thermal power station, Andhra Pradesh. NTPC has selected HGE for this project, which is the first of this nature in the country, according to the release.

The order is valued at Rs. 5.9 crores and has been bagged by HGE with Batliboi and Company Ltd., an associate for the mechanical and electrical works.

OIL REFINERY AT PARADIP ON ANVIL

A six million metric tonne capacity oil refinery would be set up "very soon" near paradip, according to the Orissa Chief Minister, **Mr. Biju Patnaik.**

A proper site for the oil refinery was being selected. The proposed refinery would generate employment potential for at least fifteen thousand chemical engineers, he said. Stressing the need for improving the work culture in Orissa, Mr. Patnaik said in Korea, fifteen thousand workers ran steel plants of fifteen million tonnes capacity, but if the current work culture in Orissa was any guide, two-and-a-half lakh workers would be needed to run a fifteen million tonnes steel plant.

More oil supplies from Gulf likely

India may tie up fresh term contracts with Saudi Arabia, Iran or Kuwait to make up for the shortfall in petroleum supplies from Russia. A decision is likely to be taken soon as propsects of shipments being resumed from Russia have receded.

Officials say the country has already purchased crude and petroleum products valued at over Rs. 750 crore from the spot market to make up for the shortfall in supplies from Russia during the current calendar year. About 1.65 million tonnes of crude and five lakh tonnes of petroleum products have been tied up from the spot market since January.

Russian supplies, barring the well-publicised shipment of 60,000 tonnes of crude announced recently, have been suspended since November last year. Early last month, Russian secretary of state Mr. Gennady Burbullis had, during a visit to India, assured that Moscow would fulfill all obligations under the trade protocol and that petroleum supplies would be resumed by the state-owned oil companies.

The Petroleum Ministry, however, believes that the country cannot wait much longer for the Russian authorities to take a decision. In case there is no response from Moscow within two weeks, the Ministry is likely to authorise the canalising agency for oil imports, the Indian Oil Corporation, to finalise additional term contracts with Iran, Saudi Arabia or Kuwait to make up for the shortfall. These countries have already indicated that they are prepared to make available higher quantities of crude and petroleum products.

At the same time, the Finance Ministry is anxious to avail of Russian supplies since free foreign exchange is not needed for them. Though trade between India and Russia is now designated in dollars, the payments remain within the country in an escrow amount. This compensates for the higher freight element on Russian crude. Earlier, the erstwhile Soviet Union was supplying the cheaper Iraqi crude but in face of these UN embargo on Iraq, this is no longer possible.

Under the Indo-Russian protocol, Russia is committed to supplying four million tonnes of crude and 1.1 million tonnes of petroleum products comprising six lakh tonnes of diesel and five lakh tonnes of kerosene. This is considerably lower than the contract with the erstwhile Soviet Union for 1991, which was for 4.5 million tonnes of crude and 2.2 million tonnes of products.

The actual shipments, however, were only about three million tonnes of crude and 1.65 million tonnes of products. Mr. Burbulis had assured New Delhi that incentives would be given to the state oil companies to provide crude and petroleum products to India even though hard currency payments were not being made. The oil companies have been reluctant to supply to India as they are yet to be paid about Rs. 1,500 crore under the earlier rupee trade account.

These payments had been made by the Indian authorities but had not been transferred to the oil companies by the Russian banks.

PETRO-GOODS POSITION COMFORTABLE

The overall availability of petroleum products in the country is very comfortable to meet the demand of the states. This was stated by the Joint Secretary (Marketing) in the Ministry of Petroleum and Natural Gas, **Mr. Falguni Rajkumar** while addressing the oil industry meeting of State level co-ordinators and representatives. In spite of this overall comfortable position, the sudden spurt in the HSD demand during May has caused a low stock situation in some parts of North India.

Cost cutting takes CIL out of the red

Coal India Ltd. (CIL), which meets over 68 per cent of the energy requirements in the form of power and coal, has ultimately come out of the red in the financial year 1991-92, says a CIL, document.

The document — Knowledge of Insiders — says sincere efforts of taking stock of the earlier experiments have helped the company in settling most of the chronic problems during the year. In the field of economic management also, the company has registered success.

With the beginning of 1991-92, CIL was facing critical resource problems and industrial relations crisis. The company had to slash its plan outlay with the provision of Rs. 1,450 crore for 1991-92, less than the expenditure of Rs. 1,655 crore incurred during the corresponding period last year, says the document.

In spite of nation-wide apprehension that the company will not achieve the target of 203 million tonnes for 1991-92 as the cuts effected major areas like equipment purchases and resulted into dropping of a few proposed projects of national importance, besides slowing down a few other ongoing projects. It is forging ahead for a better tomorrow, the document says.

The reduction in the unit cost of production by five per cent has also been achieved in real terms by the company. The collection of coal sale dues during the year under review was higher by 15 per cent (Rs. 989 crore) than the previous year, mainly because of introduction of "cash and carry" system for coal despatches to power sector from October 1, 1991.

Between October and March 1991-92, collection of the coal sale dues was higher than that of previous year by Rs. 1,097 crore (33 per cent). Against budget estimate of Rs. 2,035 crore, capital expenditure has been controlled to around Rs. 1,450 crore without affecting long or short-term production potentials, which has created substantial favourable impact on the interest and depreciation components of the operating costs, and will boost CIL performance in the years to come.

For the first time, the company has made payment of Rs. 53 crore to the government and contained the long-term borrowings at Rs. 70 crore only against Rs. 520 crore in 1990-91.

To exercise economy in the purchase of machines and spares, the department of purchase has been bifurcated and a central inventory cell has been set up under finance directorate, thus Rs. 400 crore had been realised with sale of redundant machineries or spares.

An export of 20,000 tonnes of coal had already been made to Bangladesh adding $1.2 million to the exchequer and additional supplies of about one million tonnes of coking coal to the steel sector had saved $70 million during the year. CIL had also repayed over Rs. 451 crore to the government against loans and interest despite the cut in budgetary support from Rs. 549 crore to Rs. 399 crore during 1991-92.

During the year 30 million tonnes of coking coal reserve had been identified with 14.24 million tonnes as proven, 13.35 million tonnes as indicated and 2.64 million tonnes as inferred. CIL had located an additional coal reserve of 900 million tonnes of non-coking coal through its own drillings during the year. This drilling had been done in five blocks, of which two blocks were in Bihar having reserve of 690 million tonnes. The company has also paid an amount of Rs. 1,448 crore to the state exchequers in the form of royalty, cess and sales taxes, which include the clearance of dues of Rs. 197 crore of the previous year also.

BPCL confident of setting up new refinery

Bharat Petroleum Corporation Ltd. (BPCL) is not keen on joining hands with either an Indian or foreign private partner to set up the proposed six million tonne grassroot refinery in the North. The Corporation has written to the Petroleum Ministry that it has the necessary wherewithal to raise funds for this project estimated to cost Rs. 3,000 crore. The Petroleum Ministry is understood to have forwarded BPCL's proposal to the Bureau of Public Enterprises to evaluate it.

As per the funding pattern drawn up by BPCL for this proposed project, the Corporation wants the freedom to offload two crore equity shares at a suitable premium. The Corporation has reserves amounting to roughly Rs. 800 crores which can be utilised for part funding the project. In addition the Corporation has also proposed to tap the Euro-market for $200 million which will take care of foreign exchange component.

The Corporation has also proposed, subject to necessary approvals, to raise some Rs. 1,400 crore by means of instruments such as PCDs and NCDs. BPCL has not taken into calculation some Rs. 250 crore of internal accruals per annum. Thus the Corporation is confident that if the Government gives the necessary clearance it can go ahead and set up the prestigious refinery on its own. The Corporation, which proposed the project last year, is in the process of identifying locations for the refinery, somewhere along the UP-MP border.

The Government has not yet made it clear whether it will allow BPCL to set up the refinery all by itself or by inducting Indian parties or multinationals by floating global tenders. Apparently, the Petroleum Ministry and the Finance Ministry are holding divergent views on the issue. BPCL's proposal to go on its own by diluting, is so fine-tuned that the Government's holding in the Corporation will not come down below 51%.

Meanwhile, BPCL has received clearance from the Government for laying a 230 km long product pipeline from Bombay to Manmad at an estimated cost of Rs. 228 crore. According to **Mr. R.K. Sukhdevsinghji,** officiating Chairman and Managing Director, BPCL, the pipeline will follow a route identified by the company and will be one metre below the ground. The proposed pipeline will help to decongest the city and will eliminate the transport of petroleum products by tankers and wagons, he added while addressing newspersons in Bombay on May 26.

On the safety aspect of the pipeline, **Mr. Garg,** Director (Refinery) hoped that the pipeline will not be tampered. The pipes will also be thick enough to withstand underground pressure, he added.

The product pipeline would provide an overall saving of Rs. 27.28 crore by 1996-97, which would increase to Rs. 38.3 crore by the end of the century, by way of savings in transportation cost and product loss.

Expansion in benzene production

BPCL has also plans to expand its benzene production from 90 tonnes to 230 tonnes initially and subsequently to 310 tonnes at its refinery in Bombay, as well as to increase the capacity of the LPG bottling plants at Calcutta, Madras and Meerut and Lube blending plants at Asaoti and Madras.

On the supply of LPG cylinders to domestic consumers, Mr. Sukhdevsinghji claimed that only 18 lakh were on the waiting list of the Corporation.

BPCL commissioned a major installation at Cochin with a total storage capacity of 1.54 lakh kilo-litres. The installation has facilities to handle naphtha, petrol, diesel and kerosene. This will enable faster handling of tank parcels and improve the operational tankage cover in Cochin.

Higher Sales

Announcing the company's financia results for 1991-92, the chairman sai the company has done exceptionall well. BPCL is expected to achieve record sale turnover of Rs. 8,842 crores The gross profit is estimated to b Rs. 403 crore before depreciation, inter est and taxes as against Rs. 349 crore during the previous year. The net profi after meeting all charges, includin taxes, will be around Rs. 149 crores The net worth of the corporation woul increase to Rs. 797 crores, which woul be Rs. 133 crores more than 1990-91 The earnings per share (EPS) will touc an all-time high of Rs. 30 which is 15.4 per cent over the previous year o Rs. 26.

The corporation improved its sales t 10.7 MMT representing a growth of 3.2 per cent over last year. Record sales o high value products like benzene hexane and SBP were achieved durin the year. In LPG, BPCL has been abl to achieve customer enrollment o nearly 2.52 lakhs during the year takin the toal all-India customer strength t 40.46 lakhs.

BPCL's contribution towards bulk bitumen sales was the highest in the oi industry, as it sold 67.1 per cent of tota bitumen in bulk. BPCL also exporte 466 MMT of naphtha, thus earning valuable foreign exchange to the tune o Rs. 231 crores.

Improved throughput

BPCL's refinery achieved a crude throughput of 6.962 MMT during 1991-92 as against 6.911 MMT for th previous year. The refinery processed three new types of crude this year bringing the total number of crudes processed to 42 so far.

The refinery also acheived a record throughput of products such as MS & bitumen. BPCL's refinery was also given an award for energy conservation for 1991.

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World Bank demands environment study for power projects

The World Bank has slapped an unprecedented pre-condition seeking environmental impact assessment reports for 10 major power projects that are to be funded from a $1 billion loan sought under its "time-slice approach".

The projects to which the condition is immediately applicable are — Anta Gas II (430 MW), Talcher II (1,000 MW), Yamunanagar (840 MW), Mangalore I (420 MW), Vindhyachal II (1,000 MW), Faridabad Gas (800 MW), Farakka III (500 MW), Rihand II (1,000 MW), Ramagundam III (500 MW) and Ib Valley project (1,000 MW).

The bank has warned that even committed aid for projects would be suspended if the government failed to fulfill the conditions within a time limit. The move implies that not only would the Power Ministry have to seek clearances for funded projects from the Environment Ministry, but also from the World Bank. As part of the pre-conditions, the bank is also likely to appraise the Environment Departments of NTPC and NPTC.

The National Thermal Power Corporation, whose projects will be delayed if the condition is accepted, is resisting the move even as the $400 million first tranche of the loan is being negotiated. NTPC sources say that what is most disturbing about the new conditions is bank's insistence on the increased role of non-governmental organisations (NGOs) in the formulation of rehabilitation and resettlement schemes for major projects. There is a feeling in official circles that the NGOs have been stalling clearances for power projects on the pretext of environmental concerns.

The NTPC feels that consultation with NGOs would prove to be a non starter for projects lined up under th Bank's aid programme. The team t Washington is likely to point out tha the attitude of the NGOs in the India context is remarkably different from tha prevailing in other countries where th bank has been aiding power projects

In fact, at a meeting in New Delhi o May 18, Power Ministry official expressed resentment over the delay i according environment clearances to a many as 78 central and state secto power projects.

The meeting was chaired by **Mr A.N. Verma,** Principal Secretary to the Prime Minister. Officials feel that the bank's demand for the environmental studies as per global standards would only delay domestic clearances for the projects.

Officials say that already on account of pending environmental clearances, many power projects have yet to be cleared. This is despite the constitution by the Prime Minister of the Standing Committee on Development Projects, under Planning Commission Deputy Chairman **Mr. Pranab Mukherjee,** to speed up clearances.

4 BILLION TONNE COAL RESERVES IDENTIFIED

Four billion tonne of additional coking coal reserves have been identified by the geo-scientists of the Central Mine Planning and Design Institute Ltd. (CMPDIL). The total coking coal reserves thus stand at 33.9 billion tonne, as against 29.7 billion tonne, which was earlier reported by the Geological Survey of India (GSI), according to a compendium prepared by the geo-scientists of the CMPDIL. However, the compendium said that a detailed laboratory test would be needed to prove the exact quantum of coal suitable for metallurgical purpose.

HEALTH-CARE INDUSTRY:

Inadequate patent protection deterring investments

American health care companies find India an attractive market but feel discouraged by several factors including ineffective patent protection. Among the factors cited at a seminar on the health care industry in Chicago by businessmen, were the lack of proper protection for patents, the control of prices by government and the high cost of importing machinery and intermediate goods.

Michael Privetra from Pfizer International said that the company's Indian operations had seen profits tumble and costs spiral. He said the Indian subsidiary of the company, one of the largest pharmaceutical companies in the world, had also been hurt by government control of prices. Privetra nevertheless added that India is a vast potential market. Drug consumption is as low as $1.50 per annum, he said.

John Kapoor former president of Lyphomed, a successful generic drugs company, said that the Indian Government fail to take into account the research and development costs when fixing drug prices. R&D is the largest cost in the drugs manufacture in western countries. "Raw material costs are but a very small constituent of the final price but that is not enough", Kapoor said.

Businesses looking to invest in the medical field in India should target high technology areas and should be prepared to face a very competitive market, said Kapoor, who now heads E.J. Financial Enterprises, which provides venture capital to health care companies. He said India is a decade behind western standards in providing health care.

Mr. D.B. Gupta of Lupin Laboratories said his company was exploring possibilities of selling in the United States. He said one of the drugs manufactured by his company called *Combutal* used for treating tuberculosis had a huge demand outside India.

"The spread of tuberculosis in the United States recently provides us with an opportunity to explore this market", he said. At another panel that was also organised as part of the seminar on investing in India organised by the Kellogg School of Management executives of several small and medium-size American companies involved in supplying software said that they saw an opportunity in developing software in India but are concerned about protection of intellectual property rights.

EXPORT, IMPORT CONTROLS TO GO BY YEAR END

The Union Minister of State for Commerce **Mr. P. Chidambaram** has said all controls on export and import trade would be removed by the year end. Participating in an open house discussion on the new Exim policy, organised by the Federation of Indian Exporters Organisations (FIEO) in Madras, he said the policy had removed all controls except some in view of the foreign exchange crunch.

He said the Centre wanted the rupee to become a fully convertible currency in the next four years and it could be achieved if the trade cooperated with the government.

The country had to export goods worth Rs. 50,000 crore annually to keep alive the economy, whose standard import bills for petroleum products, fertilisers and life saving drugs alone amounted to Rs. 25,000 crore a year. To bring a quality awareness among exporters, the Centre had launched a nation-wide quality awareness camp from May 19 to last for a year.

Comprehensive plan to boost science soon: Prime Minister

Prime Minister **Mr. P.V. Narasimha Rao** has said the government will shortly come out with a cogent and comprehensive plan to give a boost to various programmes in science and technology.

This area would receive special attention in spite of all the other distractions and so called priorities and the plan would be within the resource limits, the Prime Minister said after giving away the Om Prakash Bhasin Awards for science and technology.

The Prime Minister said noted scientist **Mr. M.G.K. Menon** met him with certain amount of agony and told him that the scientific community and the scientific programme in the country had suffered a setback with the programmes not going on as expected.

Mr. Rao said he agreed with Prof. Menon and felt that the area deserved special attention in the genuine sense. Either there is special attention or none, he said pointing out that the government immediately moved in the matter.

"I took the advice of Prof. Menon and others and we got to examine in what manner whatever is missing is brought back," he added. "These kind of programmes should be nurtured continuously as once there is a break, then whatever you have done goes waste," he said.

"Sometimes everything was considered as top priority and in the process priority was lost. So even in prioritisation there has to be some method in the area of science and technology," he said and added that whatever possible would be done within the possible speed.

Mr. Narasimha Rao recalled India's commitment to developing countries to implement a gene bank and programmes on solar energy. India's prestige was involved in this, he said appealing to the scientific community to extend their full cooperation in these two areas. Congratulating the award winners the Prime Minister said it was gratifying to note that the award covered the applied and basic sciences.

He said when he visited the Pauri Garhwal area recently and earlier the Uttarkashi area, he was told about the deficiencies in the designs of houses there.

Although he was unable to give them a convincing reply he expressed confidence that the personnel at the Roorkee University would be able to meet this challenge.

Mr. Rao said it was essential to supply the missing link between the scientists and the real beneficiaries of their work. Seven leading scientists were given the awards which carried Rs. 50,000 in cash, a citation and a memento each.

Dr. S. Ramachandran, Secretary, Department of Biotechnology, received the award in the category of biotechnology; **Dr. R.S. Paroda,** Deputy Director General, Indian Council of Agricultural Research and **Dr. Y.L. Nene,** Deputy Director General, International Crops Research Institute for the Semi-Arid Tropics, shared the award in the agriculture and allied sciences; **Prof. Rajinder Kumar,** Dean, Indian Institute of Science, Bangalore, received the award in engineering and transportation category; **Dr. T.K. Bose,** IIT Madras, in the space and aero space category; and **Prof. Madan Mohan,** Adviser Ministry of Health and Family Welfare and **Prof. U.C. Chaturvedi** of King George's Medical College Lucknow, shared the award in health and medical sciences.

FICCI URGES ANTI-DUMPING MEASURES

The Federation of Indian Chambers of Commerce and Industry has advocated the need for taking anti-dumping measures. In a paper entitled 'New Trade Policy — Some Problem Areas', FICCI cautioned that under the new liberal environment, dumping of foreign goods in the Indian market was bound to intensify and it would be pertinent that appropriate anti-dumping measures were taken by the government expeditiously.

The FICCI paper noted that with external debt rising more than $70 billion and a trade gap of $5.93 billion during 1990-91, exports would grow at the rate of 15 per cent during the Eighth Plan.

The paper pointed out that while the Central government had laid down the framework for export promotion, very little effort had been made in this regard by the state governments. The paper suggested a built-in incentive structure for states to encourage them to participate in the export promotion programmes.

FICCI felt that the five-year import-export policy for 1992-93 had not given adequate attention to deemed exports. Deemed exports cover large area of supplies in India, including supply to project financed by multilateral funding agencies.

The government would have to provide necessary incentives to Indian bidders in case of international competitive bidding.

Additionally, the supply made to UN organisations or under its aids programme, which was there in the previous policy statement, had been left out in the recent policy announcement, the paper pointed out.

India opposes free access to genetic material

Even while negotiations are under way in Nairobi on an international convention on bio-diversity to be signed at the Earth Summit, India's country paper for the Rio Summit has come out strongly against any convention that will allow free access to genetic material to researchers while denying the fruits of bio-technology to the country where the genetic material originated.

A 50-page country paper has been prepared by the Ministry of Environment and Forests — the actual work on the report has been done by the Centre for Environment Education, Ahmedabad — which will be presented at the Earth Summit as India's official report on environment and development in the country, setting out the traditions, concerns and efforts made for a cleaner and safer environment.

The paper also dwells on global environmental issues and clearly puts India's stand on these in perspective, including its stand on the question of a bio-diversity convention. To quote: "Issues of bio-diversity must be discussed along with the sharing of bio-technology, sharing of results of R & D and the commercial benefits derived from bio-materials."

It points out that often its traditional knowledge acquired by communities over centuries that forms the starting point for identifying particular species for particular applications and that "this must be kept in mind in any discussion on intellectual property rights related to bio-technology."

Tremendous research base

In India, for example, over 50,000 varieties of rice are found and this offers a tremendous base for future research. While India recognises that bio-technology research must be adequately compensated, mechanisms other than the prevalent system of Intellectual Property Rights (IPR) are required. The researcher can be compensated but without restricting the use of the bio-technology. This seems to be the bottomline on which most developing countries agree and any successful bio-diversity convention would have to consider this view.

As explained in the paper when the original genetic material is collected, no payment is made to the country. However, the technology derived is patented and often sold back to the very countries from where the original material is taken. The countries of the South are rich in bio-diversity and it is this material which will form the basic genetic pool for future research in the area of food and medicine.

North stand countered

So far the countries of the North have been pressing for a convention that would ensure that areas rich in bio-diversity are preserved (for example, the tropical forests), that these are declared to be global resources with free access for all to the bio-material.

And naturally, the developed countries would like to patent any technology that is derived from the use of this material.

This position has been strongly countered by India and other developing countries who want a 'quid pro quo' convention. That is, free access to bio-material is given by any country, then the technology derived from it must also be made available to it free of any patent right, and free of cost.

Any safe global environment strategy must get the cooperation of the developed as well as the developing countries and issues that need to be resolved and steps that have to be taken must be seen in a spirit of a global partnership.

For this, access to environment friendly new technologies was essential so that more countries are not forced to buy older and more polluting technologies that are causing havoc with the planet's environment. Mechanisms must be in place to prevent wrong decisions for lack of funds, and global funds must be found to subsidise the difference. As in the case of the amended Montreal Protocol, India has been pressing for a global fund that would take care of all incremental costs incurred in switch over to environmentally more friendly technologies.

UNITS ASKED TO SUBMIT MONTHLY OUTPUT RETURNS

All industrial undertakings have been asked to submit monthly production returns within a specified period to their respective authorities.

An Industry Ministry press note said that the returns are required to be submitted by all industrial undertakings irrespective of the fact whether they are exempted or not from the licensing provisions of the Industries (Development and Regulation) Act of 1951.

A copy of the production return shall have to be submitted to the concerned Administrative Ministry of Department also, it said. In the case of small-scale and ancillary units, the returns shall be submitted to the state director or commissioner of industries and to the department of small and agro and rural industries with a copy to Small Industries Service Institute.

INTERNATIONAL CATALYSTS PLANT PLANNED NEAR PUNE

International Catalysts Ltd., a company promoted by Petron International, Inc, USA along with NRIs and others, is setting up a plant to manufacture catalysts at Kurkumbh near Pune. To part finance this project, the company plans to enter the capital market in July 1992, with a public issue of 46 lakhs equity shares of Rs. 10 each for cash at par.

US may place Chinese-type IPR regime on India

The escalating US trade retaliatory action against India may lead to the latter facing a request to enter into a bilateral deal, incorporating large elements of the recent intellectual property rights (IPR) agreement between China and the US reports *The Economic Times*. The US having got first Mexico and later China agree to its proposed IPR regime, may now turn the screws on India, which is already confronted with a spate of trade and other retaliatory measures in the last few days. In fact, observers say that the recent US retaliatory actions, which are on the increase globally, indicate the US's determined bid towards placing such a request on India.

After redesignating India under Special 301 and suspending duty free generalised system of preference treatment to $60 million worth of Indian exports of pharmaceuticals, chemicals and allied products, the US has made it clear to India that these decisions "could be reversed if India addressed US concerns on patent protection." Also, the US has said that after Mexico agreed to upgrade its patent regime on the accepted lines, GSP preferences regime was expanded to cover a host of Mexician products.

Even as the Uruguay Round multilateral trade negotiations are currently underway, China, which is not a contracting party to the GATT, has entered into a major bilateral agreement with US in January last, providing a host of unprecedented concessions to US chemical and pharmaceutical products.

Among other provisions, the Chinese administration has agreed to provide patents for all chemical inventions, including pharmaceuticals and agricultural chemicals, both in products and process. Similarly, the terms of protection for a patent of invention will be 20 years from the date of filing of the patent application. More important, the introduction of product patents envisage both importation and local production.

Article 2 of the US-China agreement envisages pipe-line protection to US pharmaceutical and agricultural chemical product inventions from January 1, 1986, which is a radical departure from the Dunkel text now being discussed in the Uruguay Round. However, the above conditions will be waived in the case of non-commercial public use.

The US has succeeded in forcing the developing countries barring India, to agree to an IPR regime close to its interests. In fact, the differences between US and EC countries on trade-related intellectual property rights (TRIPs) are minimal. However, the EC countries were more sympathetic to the interests of the developing countries unlike US.

Thus, the current spate of US retaliatory measures on India indicate a concerted build-up within the US administration to place a stringent IPR regime on India before the Uruguay Round completed its negotiations. The Uruguay Round according to its director general of the GATT "faces the danger of unravelling because of fatigue, frustration, disenchantment and missed deadlines," Mr. Dunkel is reported to have said that if the Uruguay Round achieve its objectives, it would increase multilateral trade flows by $195 billion.

CII TO FOCUS ON DEVELOPMENT OF NEW INDUSTRIAL CENTRES IN GUJARAT

Confederation of Indian Industry CII(WR) Gujarat committee, in its charter for 1992-93, has identified the theme of "building industry competitiveness through joint industry Government action." This decision was taken at the first meeting of the Gujarat State Committee of CII(WR), held in Ahmedabad on May 22 under the chairmanship of **Mr. Naishadh I. Parikh.**

To implement its workplan, it has evolved a double pronged strategy —firstly to focus on the work required to develop the internal capabilities of industry in the State through developmental programmes covering technology development, energy conservation, technical education and HRD etc., leading to a substantially higher industry competitiveness. Secondly, CII would pursue with the State Government for facilitating and taking forward the process of de-control and procedural simplification, started by the Central Government last year.

CII has shown willingness to work with the State Government, as a junior partner, in promoting economic growth and development of the State's industrial economy. CII's workplan in the following year would lay special emphasis on these priority issues. Specific activities planned by CII in Gujarat for enhancing industry's competitiveness, include programme on total quality management and ISO-9000. The objective would be to expose industry to modern management as well as technology and international practices and to help in building internal capabilities of the industry leading to enhanced competitiveness.

It has also decided to expand its activities and operations. Having consolidated and established itself in Ahmedabad last year. CII, this year, would give more thrust to developing other industrial centres in places like Baroda, Surat, Valsad, Rajkot, Bhavnagar, etc.

For this, CII has decided to set up three zonal committees — West Gujarat zonal committee for the Saurashtra region: Central zonal committee for Anand, Baroda, Bharuch and Ankleshwar, and South Gujarat zonal committee for Surat, Navsari, Valsad, Vapi, etc.

EIGHTH PLAN DOCUMENT:

Two-fold strategy to boost exports planned

A two-fold strategy is to be evolved to boost exports from India during the Eighth Plan period. The strategy involves further pruning of the negative lists of imports and exports and a gradual reduction in both the level and dispersion of tariff rates, according to the Eighth Plan document approved by the National Development Council recently.

The plan document suggests removal of most raw materials and components from the negative list of imports as a first step, even though it feels that it was difficult at this stage to pinpoint the specific items required to be taken out of the negative lists.

77% exports from manufacturers

The document, which envisages a 13.6 per cent annual growth rate of exports in terms of volume, says primary commodities would constitute 18 per cent of exports and manufactured commodities 77 per cent.

Among the primary commodities, a large proportion of the earnings from incremental exports during the Eighth Plan would be from agricultural and allied products.

Exports of agricultural and allied products are expected to jump from Rs. 7,545 crore in 1991-92 to Rs. 12,064 crores by 1996-97, registering a 9.8 per cent growth.

Among these products, unmanufactured and manufactured tobacco items are expected to register a 20.2 per cent growth during the period under review — from Rs. 430 crores to Rs. 1,079 crores. Sugar and sugar preparations stand second with a 15 per cent growth — from Rs. 125 crores to Rs. 251 crores.

Cashew kernels are projected as third in the list with a 13.7 per cent growth, going up from Rs. 720 crores to Rs. 1,368 crores. Next in the list is rice, export of which is expected to jump from Rs. 570 crores to Rs. 1,005 crores — a 12 per cent growth rate.

Export of traditional items like tea and coffee are going to suffer during the Eighth Plan, according to the plan document. Their growth rate has been projected as 2.8 per cent and 2 per cent respectively.

Exports of spices are projected at 5.5 per cent during the period. The growth rate of manufactured goods is projected at 15.4 per cent during the plan period, taking the export level from Rs. 32,060 crores in 1991-92 to Rs. 65,721 crores by 1996-97.

Woollen textiles top the list in this category with a growth rate exceeding 20 per cent. In terms of value, they are expected to move up from Rs. 80 crores to Rs. 200 crores. Coir yarn and coir manufactures are expected to attain a growth rate of 23.4 per cent — up from Rs. 70 crores to Rs. 200 crores.

Chemicals and allied products are in the third position with a 17.6 per cent growth rate — increasing from Rs. 4,000 crores to Rs. 9,000 crores. They are followed by engineering goods (16.2 per cent) and handicraft (16 per cent). While readymade garments are expected to attain a 15.1 per cent growth rate, leather and leather-manufactured goods are expected to attain a growth rate of about 15 per cent.

Among handicrafts, exports of gem and jewellery are projected to go up from Rs. 7,200 crores to Rs. 15,000 crores, showing a 15.8 per cent growth rate and art works a 13.9 per cent growth rate. The total exports by the end of the Eighth Plan are estimated at Rs. 330,078 crores in rupee terms with an annual growth rate of 13.6 per cent. The exports are projected to go up from Rs. 44,292 crores in 1991-92 to Rs. 83,839 crores in 1996-97. In dollar terms, the total exports are likely to be $132,071 million, with the same growth rate of 13.6 per cent as in terms of the rupee. This is expected to jump from $17,720 million to $33,548 million during the period under review. A part of the gap in the merchandise trade has been covered by invisibles.

While the balance of invisibles has been positive, a declining trend, however, has been observed in the balance during the recent periods. Sixty-one per cent of the trade gap during the sixth plan was covered by invisibles. This component declined to 29 per cent during the Seventh Plan. The situation has worsened during the last two to three years and the balance of invisibles has been reduced to an almost negligible figure.

The main reason for this is that interest payments have gone up while earnings from foreign travel and private transfers have remained static. The Eighth Plan is expected to reverse this trend and take specific measures to raise earnings from tourism and services. Invisibles are projected to amount to Rs. 14,600 crores, which would cover 21 per cent of the gap in merchandise trade during the plan period.

MAHA CHEMICALS TO SET UP 100 PER CENT EOU

Maha Chemicals is setting up a 100 per cent export oriented unit (EOU) for the manufacture of zinc oxide at Kalol, Gujarat. The licenced production capacity of the project is 15 tonnes per day.

The commercial production is expected to start by October 1992. The company plans to export its products to countries like USA, Europe, Africa, the South East and Middle East countries.

To part-finance the project, the company plans to enter the capital market with a public issue of Rs. 2.10 crore.

STEEL PRICES:

Hike based on market absorption capacity

An assessment of what the market can bear has very substantially determined the quantum of steel price markup, say main producers' sources. It is apparent that while exercising their newly won "freedom and right" to fix prices the main producers took extra care to see that they do not incur the wrath of the Union Government, the sources said.

In support of the premise of what the market can bear, they cite two specific instances. The first relates to GP/GC sheets whose prices have been increased by Rs. 1,200 per tonne by Steel Authority of India Ltd. The sources point out that they could not ignore the reality that the market for these items currently is dull and that they face competition from the secondary producers.

But for these factors, they might have opted for a larger increase for the two cold-rolled base materials. The second instance is of billets, blooms and small slabs for which SAIL has notified an increase of Rs. 2,000 per tonne.

The prime consideration in this case has been to narrow down the difference between the prices of their products and those of secondary producers who, taking advantage of the relatively small presence of the main producers in the market for semis, have been charging sizeably higher prices.

The main producers have had to put up with realising almost Rs. 2,000 a tonne lower till a few months back. According to their information, currently, the secondary producers' prices of these items are Rs. 2,500 to Rs. 2,800 a tonne higher. But, the main producers have decided to restrict the hike to Rs. 2,000 and in the process substantially closed the gap. An attempt at rationalisation and yet derive optimum benefit is evident in the hikes for HR and CR items.

While the increase, is Rs. 2,300 for HR sheets and Rs. 2,000 for HR coils/skelp the raise has been limited to Rs. 1,800 for CR coils/sheets despite the fact that there is a greater degree of value addition in the CR items. On quite a few occasions under the administered price regime, the increase in the case of CR items had been rather steep. Moreover, apparently, the main producers have tried to ensure that cold rolling units in the secondary sector, who buy the HR items from the main producers, do not get a chance to derive undue benefits; first by paying relatively less for the HR items and then by charging relatively more for their CR items.

The hike for the railway items quite clearly suggests that they have sought to derive the maximum advantage from their being a monopoly supplier. Though a costly proposition for the monopoly buyer, the railways, the new prices should prove a boom to SAIL's Durgapur and Bhilai steel plants who often in the past resented the niggardly hikes for their products under the administred price regim.

The raise is Rs. 1,900 for rails/sleepers, Rs. 3,450 for wheels and as much as Rs. 3,700 for axles. **Mr. P.R. Raghavan,** Executive Director of Central Marketing Organisation of SAIL, feels in the new and evolving market situation, the accent has to be on intensifying customer contacts and improving services to customers. SAIL, says Mr. Raghavan, is taking steps to address itself to the marketing challenges.

The mark-up for some of the other important steel items are: wire rods in coils/round 12 mm and above in straight length Rs. 1,800, torsteel 8-10 mm Rs. 2,000, 12 mm and above Rs. 2,200, all angles upto 90 x 90 x 12 Rs. 1,250, above this and upto 130 x 130 Rs. 2,750

and 130 x 130 Rs. 2,000, channels Rs. 1,500 to Rs. 2,200 and Rs. 2,300 for three different categories, joists Rs. 1,750, Rs. 2,200 and Rs. 2,300 for three different categories and plates/chequered plates 5-10 mm Rs. 1,800 and above 10 mm Rs. 1,200. The price of pig iron has been jacked up by Rs. 750 per tonne.

STEEL CHAMBER FLAYS PRICE HIKE

Steel Chamber President **Mr. Dhanpat Shah** has questioned the rationale behind the steep price increases announced by the integrated steel producers in the country.

The increase in the case of TISCO works out to between 20 and 22 per cent and in the case of SAIL around 15 per cent. Mr. Shah says that actual impact of the move on market prices of iron and steel materials will be still higher as there will be corresponding increases in the incidence of sales-tax and octroi.

The burden on this account will be around 6.5 per cent. Observing that this is the third price hike during the current year — the earlier ones were to offset the impact of higher excise and railway freight — Mr. Shah feels that the new round of steel price increases will result in cost push effect and raise the inflation rate all along the economy. He was also of the view that this was going to adversely tell upon the working of engineering, automobile, construction and other industries using steel in bulk.

There will be no alternative for these industries than passing on the higher costs to downstream users, according to the Steel Chamber president. What is deplorable, he adds, is that even in such items like galvanised corrugated sheets which are required and used by the common man, prices have been increased by more than 15 per cent.

Referring to the steel producers' contention about the impact of higher input costs and freight increases, Mr. Shah says that instead of following the easier path of increasing steel prices, the producers should have concentrated their efforts on bringing about economy in their operations, increase capacity utilisation, rates and absorb some of the cost increases. "Even if a hike becomes necessary, it should not be more than 5 per cent a time", Mr. Shah adds. According to him, the demand for steel was at present rather sluggish as a majority of the industries in the engineering sector are passing through a period of recession which is bound to further intensify as a consequence of the increase in price.

Mr. Shah was also highly critical of the Planning Commission's decision to heavily cut down the Eighth Plan's outlay for the steel sector by Rs. 10,000 from Rs. 24,000 crore, as recommended by the Steel Ministry, to Rs. 14,000 crore. A 40 per cent reduction of this order will seriously tell upon the modernisation plans of the public sector steel plants, especially those of Bhilai, Rourkela and Bokaro.

Any reduction in outlay, if at all warranted, should be nominal and the matter reconsidered, Mr. Shah said in a representation made to the Deputy Chairman of the Planning Commission, **Mr. Pranab Mukherjee.**

3 ALUMINA PLANTS FOR ORISSA CLEARED

The Centre has approved the proposal for the establishment of three alumina plants in Orissa, mostly in the private sector at a cost of about Rs. 6,000 crore, according to the Chief Minister, **Mr. Biju Patnaik.** Several private firms have shown interest in setting up plants in the state by utilising the Bauxite deposits in the districts of Koraput, Kalahandi and Sambalpur, he told new conference at Bhubaneswar on May 25.

IISCO Burnpur unit expects Rs. 25 crore profit

Having set sights on a near six-fold increase in net profits at the Burnpur Works this year, Indian Iron and Steel Company (IISCO) Managing Director **Mr. S.K. Daspatnaik** has warned the employees against falling into a success trap.

IISCO's Burnpur Works, which created a ripple early this year after reporting a net profit of Rs. 4 crore for 1991-92 after a gap of two decades, has planned for a net profit of around Rs. 25 crore in 1992-93. In a message to the employees of the company, Mr. Daspatnaik has said that after the profits of 1991-92, all efforts must be geared to prevent a slide back and to create an environment of success all around.

He has pointed out that the fact that the Burnpur Works was now making profits would reinforce decision making for the mega project on IISCO modernisation where a return on the investor's money is virtually guaranteed.

Pointing out that some hard thinking would obviously have to be done about the spun pipe plants of IISCO as well as the foundries, Mr. Daspatnaik has said that instead of sinking further, both the Kulti and Ujjain works of IISCO must be able to come up with some viable turnaround programmes at the earliest.

He has said that coke oven would have to be the plant's key area of performance in 1992-93. While landing valuable support to the downstream facilities in 1991-92, the coke ovens failed to come upto the expectations during the year, he has pointed out. In the current year, IISCO is planning to utilise ingot and billets on transfer from other steel plants to boost the plant's saleable steel production. However, it was important to place greater reliance on internal production in this regard.

Mr. Daspatnaik has asked the workers, associated with the steel melting shop, to improve its functioning so as to preserve the production symmetry which was now being threatened by a gap in the capability levels of the blast furnaces, steel melting shops and the rolling mills. Mr. Daspatnaik also called for a gearing up of the plant's marketing set up, taking constant reviews of the market demand, so as to work in tandem with the plant.

Keeping ultimate consumer satisfaction as the objective, the marketing network should be ready to meet the ever changing conceptions of the customers, Mr. Daspatnaik has said. IISCO, which exceeded the targets for 1991-92 in several areas of its operations, has aimed at further improvement in these areas during the current year. Among the areas which were able to perform beyond the annual production plan (APP), targets were hot metal, ingot steel, heavy structural and light structural mill and total saleable steel, according to IISCO sources.

IISCO, as a matter of fact, emerged as the second largest producer of structurals after the Bhilai Steel Plant during 1991-92. In the current year, IISCO plans to produce 8.47 lakh tonnes of hot metal as against a production of 8.22 lakh tonnes in 1991-92, 3.84 lakh tonnes of pig iron against a 3.88 lakh tonnes of pig iron and 4.22 lakh tonnes of saleable steel.

Mr. Daspatnaik has said that the Rs. 6,520 crore modernisation programme of IISCO, prepared by Steel Authority of India Ltd., has already been cleared by the Public Investment Board. (PIB). The proposal envisages integration of the major existing production facilities with new production and auxiliary shops.

INDAL's board recommends dividend

The Board of Directors of Indian Aluminium Company (INDAL), at a meeting recently to review the 1991-92 annual results, recommended a dividend of Rs. 3 per ordinary share, subject to deduction of tax for the financial year ended March 1992.

The company's sales turnover at Rs. 659.3 crores marked a 17 per cent increase over the level of last year. Net profit was Rs. 34.3 crores. Profitability of the company was affected primarily due to higher power cost on account of steep tariff revisions for its smelters, escalations in the prices of major inputs like caustic soda, calcined petroleum coke and pitch which ranged between 20 per cent and 30 per cent and finally, the absence of alumina export orders from the erstwhile USSR. This was stated by an INDAL press release.

It was also stated that domestic markets were affected by slow GNP growth and high cost money. Even in a flattering market, INDAL stayed ahead of demand growth in key product segments and retained its leadership position in its chosen businesses. It was, however, able to defend a major part of its profits with increased emphasis on exports of value added products, quality upgradation, product and market development and better customer service.

Exports to hard currency markets rose from Rs. 19.2 crores in 1990-91 to Rs. 37 crores in 1991-92 and earned the company a certificate of excellence from the Engineering Export Promotion Council. INDAL has also been awarded export house status.

Progress on INDAL's major projects, which included the multilayer coater and the seven-colour printing machine for foil, the modernisation-cum-expansion of the Belur sheet rolling mill, the expansion and technical upgradation of the Belgaum alumina refinery, the 67.5 MW power plant dedicated to the Hirakud smelter and the new bauxite mines in Maharashtra was on, or ahead of schedule. It was decided that the annual general meeting of the company would be held on July 2.

MMTC TO NOTIFY METAL PRICES ON WEEKLY BASIS

The Minerals and Metals Trading Corporation of India has decided to announce its prices of non-ferrous metals on a weekly basis. The prices will be announced every Friday for the following week. This marks a radical departure from the earlier practice of announcing the prices at the beginning of every month. The MMTC, which some years ago announcing prices on a quarterly basis, had decided to shift to a monthly basis in view of the wide fluctuations in international prices which made it difficult for it hold prices for a long period.

Final bids for IISCO in 3 weeks

The three parties bidding for Indian Iron and Steel Company Ltd., (IISCO) have been asked to carry out the due diligence procedure. Mukand Iron and Steel Ltd., Calcutta based Mittal Group and Lloyd Steel Industries Private Limited, will place the final bids in three weeks time, according to industry sources. The due diligence procedure will entail the companies to make independent enquiries and furnish detailed assessment reports. The companies will also be allowed to do site inspection of IISCO plant, which will be the final stage of the bidding process. By mid June, the procedure has to be completed and offer placed before the seller.

An expert committee will look into the offers set up by the Ministry with help of Steel Authority of India Ltd. (SAIL) while, SBI Capital Market (SBI CAPs), which was appointed by the Ministry to shortlist the best contenders for the project, will assist the panel. Industry sources add, this is the international practice in regard to sale of firms when the offer is come from more than one industrial house. As of today the three companies had access to the balance sheets and other related documents. After the bids are offered, the firms cannot backtrack on any ground.

Mr. Swraj Paul, industrialist, who had evinced interest in the project had declined to make an offer and subsequently his group, CAPARO had kept out. He has presently not shown any interest in the bidding process of IISCO, sources added. About 17 groups had been intimated about the IISCO project and were asked to make their offer. These included some of the small firms which had the capacity to accept the project. A two-stage approach was adopted in shortlisting the contenders in which the latter was asked to offer their project report on broad terms, sources said adding that this was just a preliminary kind of offer.

The perception of the company regarding financial requirements, labour, period of implementation of the modernisation programme and surplus, if any, was sought. Rationalisation of any plans to increase productivity, detailed offer on projected profits, labour, retrenchment, redeployment, retraining were required to be furnished. In the second phase, through the due diligence procedure an in-depth study of IISCO will be made.

Though the balance sheet reflected the financial strength of the company, a thorough study of the surplus and assets will be done by the contending firm. The buying company had also to offer details of the share capital in the take-over and lendings if any, from the Government. Final evaluation will be done by SBI CAPs after the committee of experts is formed to look into the bids and related technical aspects.

Bharat Zinc setting up unit near Bhopal

Bharat Zinc Limited, a company promoted by the Jagaran group of industries, is setting up an import substitute project at Mandideep, near Bhopal to manufacture 2,000 metric tonnes per annum of zinc metal from secondary sources. The company is also planning to enter the capital market to mobilise Rs. 2.07 crore.

The Company's Managing Director, **Mr. Hari Mohan Gupta,** said in Bhopal on May 18 that the project with an estimated capital outlay of Rs. 7.33 crores, will be the largest secondary zinc metal manufacture in the country. The project, which is based on the electrolysis process, would enable the country to meet its present zinc metal requirements and save foreign exchange to the tune of $70 lakhs per annum.

He said at present there was a shortage of zinc metal in the country which was being met out of imports. Mr.Gupta said the project had been financed by IFCI and ICICI who have sanctioned a term loan of Rs. 300 lakhs and direct equity participation of Rs. 40 lakhs.

Moreover, he said the Madhya Pradesh Audyogic Vikas Nigam had invested a sum of Rs. 21.70 lakhs by way of equity shares in the company as co-promoter. It is estimated that in the first full year of operations the turnover will be around Rs. 30 crore and the company expects to pay a minimum of 20 per cent dividend right from the first full year of operations, Mr. Gupta said.

ZINC OXIDE UNIT COMING UP IN HARYANA

Beriwal Chemicals Limited, promoted by the ABN group, is setting up a project in Haryana for manufacture of 7,200 tonnes per annum of zinc oxide. The project requires an investment of Rs. 7.50 crore and is expected to start commercial production by the end of the year, according to its promoter, **Mr. R.S. Beriwal.**

The ABN group comprises several profit making companies in the fields of finance and construction, according to Mr. Beriwal. He claimed that the Beriwal Chemicals venture would be the largest facility for zinc oxide in the country. The company had also drawn up plans to manufacture electrolytic zinc for its captive consumption, according to a company statement. The company proposes to manufacture zinc oxide by the French and American processes, according to Mr. Beriwal.

He said that the company's product had very good export potential due to a supply shortfall in the developing countries. Zinc oxide finds its major use in manufacture of automotive tyres. Mr. Beriwal claimed that his company had already started negotiations with buyers abroad for exploring the export potential.

Zinc consumption prospects better: BEM study

Zinc consumption has generally stagnated over the past few years, largely because of a slowdown in the English-speaking economies, chiefly those in North America, Billiton-Enthoven Metals Ltd. (BEM) calculates in a major new report of zinc, released recently, that when the distortions caused by peaks and troughs in consumptions are disregarded, the underlying annual rate of growth since 1979 has been little more than 1 per cent.

For zinc demand, it says, it is clear that the halcyon days of the 1960s and early 1970s, when the rate of consumption grew by 5.3 per cent per annum, have gone. Substitution, miniaturisation and improvements in die-casting technology requiring less zinc per component, all had an adverse impact, and to a great extent, demand growth over the past decade was underpinned by the non-mature economies. Their share of zinc consumption in the established market economy countries (EMECs) rose from 19.4 per cent to 25 per cent in the period 1979-90, the strongest growth being in South East Asia.

Galvanising the mainstay

In the mature EMECs it has been the galvanising sector which has been the mainstay. Consumption for this purpose in Western Europe grew by almost 31 per cent through 1979-90, and the International Lead and Zinc Study Group calculates that in 1990 galvanising accounted for 47 per cent of total EMEC demand.

By the mid-1990s BEM expects that more than half of all zinc consumed in the EMECs will be for galvanising purposes. The construction sector is the main user although the main growth has been in the automotive industry.

The second largest end-use for zinc, accounting for above 20 per cent of demand, is in brass and bronze. The construction industry uses most brass (primarily in plumbing) and BEM expects demand here to hold up comparatively well. The third largest end-use for zinc is in alloys, principally for die castings, and the sector accounts for about 15 per cent of demand.

Zinc in semi-manufactures accounts for about 6 per cent of consumption but there is a marked regional localisation in the degree of usage for this purpose with Germany and France alone accounting for 50 per cent of offtake, mainly for rolled sheet and strip for roofing and guttering in the construction industries. Hence, the performance of the housing industries in these countries will largely dictate the consumption trend for zinc in semis.

8% for chemicals

The other important use of zinc (7.7 per cent of total 1990 consumption or some 420,000 tonnes) is in chemicals where it is utilised in either metal or concentrate form to produce oxide. Zinc oxide has proved to be a vital constituent of most rubber products as it strengthens them and speeds up the toughening process.

The average car tyre, for instance, now contains about 0.16 kg of zinc oxide and the outlook for zinc chemicals demand is thus largely tied to the automobile industry. In sum, BEM sees zinc's consumption prospects as rather better in the 1990s than in the 1980s and whilst a further small decline may occur this year it expects an annual growth rate of 1.5 to 2.0 per cent to be an achievable target.

Output of mined zinc in the EMECs in 1991 reached a peak of 5.45 million tonnes (mt). Five countries — Australia, Canada, Mexico, Peru and the U.S. — accounted for two-thirds of production and their dominance seems set to continue. Elsewhere, mine closures in Germany, France, Finland and Greenland have seen Western Europe's production decline by 136,000 tonnes over the past four years to 0.95 mt in 1990 (and ILZSG reports a 10 per cent production fall in the first ten months of 1991).

Some new mines are in the pipeline but the timing of their opening is by no means certain. In Japan, mine output has halved over the past decade to around 127,000 tonnes and BEM expects that further production falls in Japan will probably counterbalance any new production in the South East Asian region.

By contrast, Japan is comfortably ahead as the world's largest producer of refined metal; it produced 0.69 mt in 1990 compared with Canada's 0.59 mt, and the USA with 0.37 mt. By region, however, Western Europe is the dominant force with Belgium, Finland, France, Germany, Italy, Spain, Norway and the UK contributing to a 1990 total of 2.1 mt.

Melting operations at Trial, B.C. following the introduction of QSL technology, needed to treat concentrates from the Red Dog mine in Alaska. At its 230,000 t/y Valleyfield smelter, Noranda has recently been operating below capacity because of supply disruptions, lower demand and technical problems.

In South America, the 100,000 t/y Cajamarquilla facility operated by Minero Peru has been beset by power problems and has been producing at only 50 per cent of capacity since early February. In central Africa as much as 0.1 mt of capacity could be lost this year if, as expected, zinc plants close in Zaire and Zambia.

Record production

Last year BEM estimates that EMEC refined output reached a record of 5.28 mt. It detects little change in the overall pattern of production and expects output to grow steadily through the

1990s, albeit from capacity expansions rather than from greenfield projects. About 2.0 mt of refined metal was traded within the EMECs last year with more than one-third exported by Australia and Canada. The amount of zinc concentrates traded was nearer 2.5 mt with Australia (0.59 mt) and Canada (0.71 mt) again the principal exporters.

Together with Peru and the USA these four countries account for an estimated 80 per cent of total EMEC concentrate exports. The biggest recipients are smelters in Western Europe and Japan.

BEM believes that at recent metal prices, between 34-40 per cent of mine capacity is failing to cover operating costs. Low metal prices may force smelters to cut back their output too, despite the concentrate surplus, and BEM expects 1990 output of refined zinc to fall by 150,000 tonnes.

With mounting environmental cost pressures this estimate may prove conservative, especially if weak prices persist. Vieille Montagne's 120,000 tpy Overpelt smelter in Belgium is closing, two small smelters in Austria Germany have already shut down, whilst Pertulosa's 100,000 tpy Crotone plant in Italy is closing for two years to permit an expansion to 160,000 tpy. Ruhr-Zink, meanwhile, is cutting its 0.2 tpy capacity by 10 per cent because of weak markets and, most recently, doubts have emerged concerning the future of the 210,000 tpy capacity of Budelco smelter in Holland following Pasminco's announcement that it intends to sell its 50 per cent interest as part of a European asset divestment.

Recovery in 1993?

Metal Bulletin Research (MBR), in its 1992 review of the zinc industry, reaches broadly same conclusions as those of BEM. It sees zinc consumption growth of around 1.5 per cent in 1992, which is less than the forecast expansion of GNP in OECD countries. It doubts that a recovery in the all important end-use markets, autos and construction, will get underway until late in the year. For 1993, however, MBR is distinctly bullish.

It forecasts zinc consumption growth in excess of 5 per cent with total offtake projected to rise by 6 per cent to 5.56 mt. Production growth is expected to be nearer 2.4 per cent, taking output up to 5.37 mt from a forecast 5.24 mt this year. The expected surge in demand, combined with an anticipated 30,000 tonnes fall in the net flow of zinc metal into the EMECs from the former Eastern Bloc countries in 1993 (estimated at 80,000 tonnes this year), MBR says, could see a supply deficit of some 145,000 tonnes by the end of 1993.

By comparison the market appears to have been in oversupply to the extent of 185,000 tonnes during 1991 — the highest surplus since the mid-1970s. MBR expects the surplus to reduce to 46,000 tonnes this year and stock levels by year-end to closer to 0.7 mt or the equivalent of 6.9 weeks consumption.

The implication is that they are likely to average around $1,200/tonne in 1992 (close to the current level on the LME) but could improve by more than 20 per cent in 1993 to average $1,450/tonne. BEM has forecast a possible supply deficit of 70,000 tonnes in 1993 only half that forecast by MBR. The BEM price forecast is thus somewhat lower with its average put at 52 cents/lb ($1,145/tonne) for 1992 and 60 cents/lb ($1,320/tonne) for 1993. Both reports seem to be in accord about the likely level of metal imported from the former Eastern Bloc countries; they differ chiefly over the speed and extent of demand recovery.

TAMILNADU POWER PLANTS MAY USE INDONESIAN COAL

Tamil Nadu is examining the possibility of tapping Indonesia for coal for its power plants, proposed to be set up at Tuticorin and Cuddalore. The two plants, of 500 MW each, are also being offered to the private sector. Bids from the private sector would be invited soon through advertisements in newspapers. According to official sources, the state government has decided to give priority to power in the Eighth Plan. This is indicated by the huge allocation of Rs. 3000 crore that has been earmarked for this sector in the plan.

Energy, along with water supply, accounts for a substantial chunk of the overall allocation of Rs. 10,200 crore for the state's Eighth Plan. The allocation for the other sectors include: Rs. 600 crore for industry, Rs. 500 crore for roads and bridges, Rs. 300 crore for urban development, Rs. 650 crore for social welfare and nutrition, and Rs. 500 crore for education.

The state government had earlier been working on the possibility of tapping the Australians for coal for its thermal units. In fact, both the Australian government and the state industrialists have been pursuing this proposal for quite some time. The move to tap Indonesia, in the meanwhile, has excited industry and officials alike.

Meanwhile, sources at Madras state that the major projects which are to be executed during the Eighth Plan include the 630 MW north Madras thermal station, new starts for the huge lignite-based 1500 MW project at Jayankondam and a 420 MW on-going project at Tuticorin. The state's plan also provides for a 300 MW gas-based power project at Nagapattinam.

SUMEX PUTTING UP EOU

Sumex Overseas is setting up a 100 per cent EOU for the manufacture of pesticides and intermediates like 2-4-D sodium sulphate, ethyl ester, lindane and glyphosphate. The total cost of the project is estimated at around Rs. 9.30 crores and it is proposed to be financed through promoters contribution, public issue and institutional finance

Hindustan Copper to tap market for Rs. 650 crore

Hindustan Copper Ltd. (HCL), a Government of India enterprise, has decided to go in for market borrowing to mop up resources to the tune of Rs. 650 crores to complete its projects in the Eighth Plan, according to its Chairman and Managing Director, **Mr. Ved Leekha.**

Speaking about the company's performance in 1991-92 Mr. Leekha told newsmen on May 17 that the HCL required about Rs. 900 crore during the Eighth Plan for the completion of its projects and added that the company would be able to provide only Rs. 250 crore. Mr. Leekha said that the withdrawal of budgetary support by the Government was "worrying us", adding that the company had decided to raise funds through fixed deposits and by issuing mutual funds to the tune of Rs. 650 crore.

The HCL board was now awaiting the approval of the Government in this regard, he said. Mr. Leekha said that the company achieved a record gross turnover of Rs. 661 crore in 1991-92 with profit after tax to the tune of Rs. 41 crore compared to a turnover of Rs. 293.57 crore and a profit of Rs. 16.12 crore in 1987-88. Mr. Leekha pointed out that the company was able to wipe out its accumulated losses and might now declare a dividend.

The company achieved an all time high production of blister copper of 46,755 tonnes and 45,495 tonnes of refined copper (cathodes) during 1991-92. Capacity utilisation, during the year was 98 per cent in the mining sector and 97 per cent in the metallurgical sector, he said.

Of the seven copper units spread over Bihar, Rajasthan, Madhya Pradesh and Maharashtra, Khetri Copper Complex produced record ore of 18,60,000 tonnes in 1991-92 compared to 18,25,000 tonnes in the previous year. Mr. Leekha said that the production of wire rod at Taloja project in Raigad district of Maharashtra was 14,607 tonnes in 1991-92 as against 21,636 tonnes in 1990-91. The reason for such low production was non-availability of the feed material (imported cathodes) due to foreign exchange crunch.

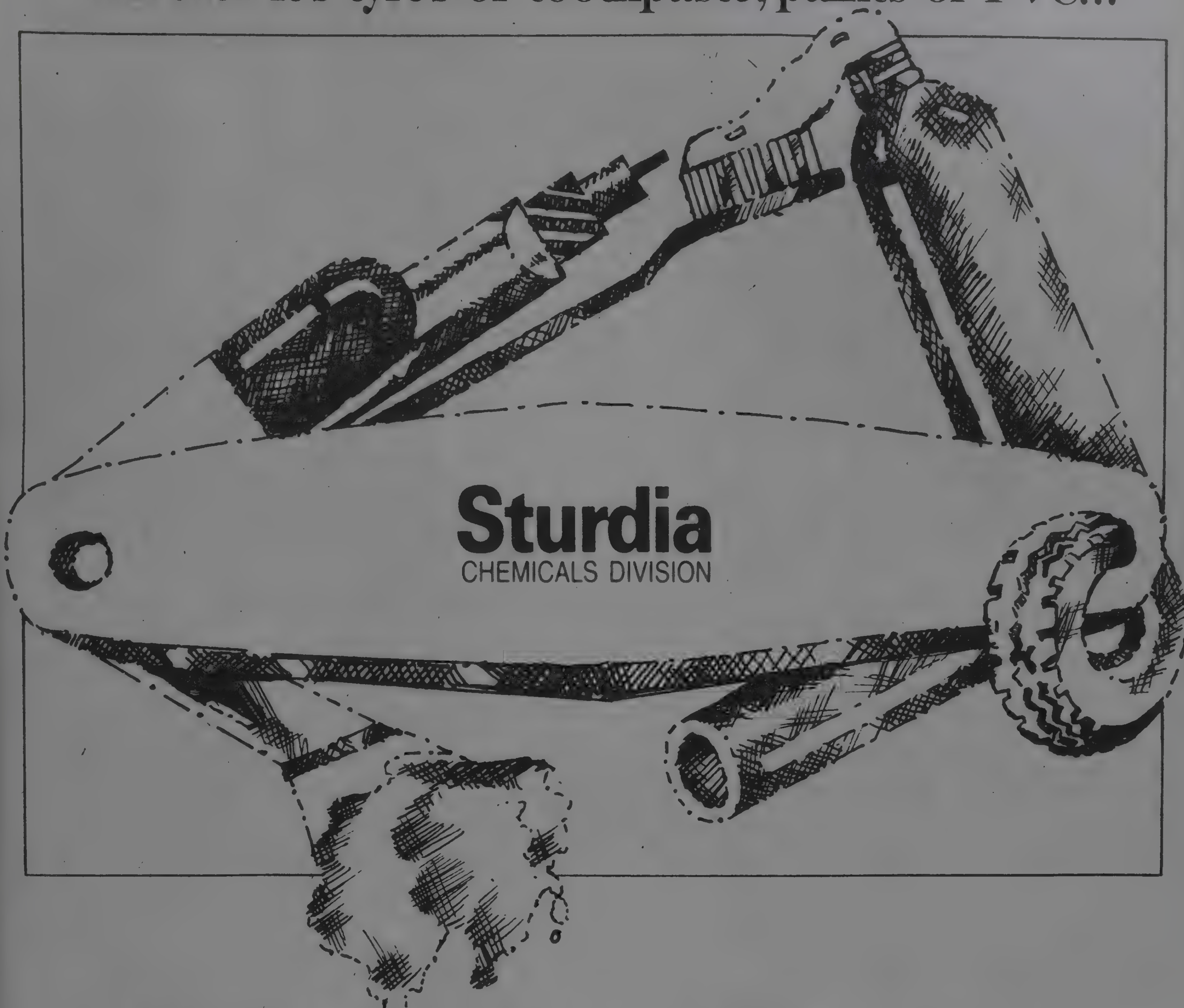
Replying to a question, he said that the company decided to import cathodes to the tune of 15,000 tonnes during the current financial year for production of 50,000 tonnes of wire rods at Taloja.

The company would need Rs. 180 crore in foreign exchange for the import if Government approval comes through. It would float global tenders for the import of good quality cathodes, Mr. Leekha said adding that, in the past cathodes were imported from Chile and Zambia.

The HCL chairman said that smelter expansion from 31,000 tonnes to 45,000 tonnes per annum at Khetri in Jhunjhunu district in Rajasthan had been approved by the board of directors at a cost of about Rs. 49.46 crore. The project was expected to be completed by 1994-95.

The expansion of mining capacity from two million tonnes per annum to three million tonnes at Malanjkhand open cast mine in Balaghat district in Madhya Pradesh costing Rs. 99.07 crore had been approved by the board and was under consideration of the Government, Mr. Leekha said.

The proposal for Banwas mine development at Khetri at a cost of Rs. 95.23 crore had been forwarded to the Government. Meanwhile, action had been taken for inviting global tenders for shaft sinking, he said. Mr. Leekha said the company proposed to invest Rs. 1,350 crore during the Eighth Plan.


Sturdia
CHEMICALS DIVISION

Highlights in Chemical Technology

HARVESTING DRUGS FROM PLANTS

In Samoa, native healers use the leaves of a small tree to treat back pain and abdominal swelling. They use the roots to treat diarrhoea and the wood to treat yellow fever. That same tree is being studied by chemists and biologists with the U.S. National Cancer Institute (NCI) as a possible treatment for AIDS.

Besides the Samoan tree, scientists with NCI's Developmental Therapeutic Programme in Frederick, Maryland, are screening thousands of other plants and animals from around the world looking for treatments for cancer as well as AIDS. "Natural products drug discovery research is nothing new", according to Dr. Michael Boyd, who led the current revival of natural products research at NCI and the development of NCI's new anti-tumor and anti-HIV (AIDS virus) screening tests essential to these efforts. "In cancer chemotherapy some of the best drugs we have today are natural products. The same is true for almost any class of medicinal agent".

Cancer chemotheraphy with naturally derived substances includes:

— Two substances isolated from the Madagascar periwinkle (*Vinca rosea):* Vinblastine sulfate, indicated for several cancers, including Hodgkin's disease; and vincristine sulfate, used especially in children with lymphocytic leukemia.

— A semi-synthetic derivative of May apple (*Podophyllum peltatum):* A common woodland plant in the eastern United States, to treat testicular cancer and small cell lung cancer.

Other naturally derived drugs include:

— Digitalis. The dried leaves of *Digitalis purpurea*, the purple foxglove are the source of this drug, which is used to treat congestive heart failure and other cardiac disorders.

— Reserpine. This substance, isolated from the roots of tropical shrubs in the genus *Rauwolfia*, is used as a sedative and to treat high blood pressure.

Marine organisms: Although there are no approved anti-cancer drugs derived from marine organisms, the marine environment has tremendous potential as a future source of drugs, according to Boyd. Several novel compounds that show potential anti-tumour activity have been isolated in recent years, and one compound, dideminim B, an extract from an organism known as the sea squirt (*Didemnidae species)*, is the first enter clinical trials for testing against several kinds of cancer.

Since 1988, NIH has had contracts with marine biologists and botanists to collect over a five year period approximately 15,000 marine organisms, mainly from the Great Barrier Reef off Australia, and 20,000 plants from places such as Samoa and the rain forests of South America and Africa.

Efficiency is a watchword for those involved in the effort to identify medicinal plants and marine organisms. "The urgency to examine the plant kingdom for new pharmaceuticals is particularly acute due to the continuing loss of plant lore in traditional cultures, wrote botanist Paul Cox in a 1989 article in the journal *Economic Botany*. In addition, the plants and marine organisms themselves may be disappearing due to pollution and urban development.

Researchers are focusing on tropical rain forests and barrier reefs due to the tremendous diversity of plants and simple organisms. In addition, Boyd explains, because their native habitat is crowded, the plants and marine life frequently develop toxins in an effort to eliminate each other. Once the samples have been collected, a multi-step process to break down and separate the specimens into smaller and smaller parts is conducted in the lab because the potential drug may be only one of many chemicals that make up a plant or animal. Plants are turned into "sawdust" with the help of power saws and other milling equipment, and the frozen marine samples are pureed, then stored in cake pans until ready to be extracted.

To extract different substances from the samples, the researchers first treat them with methylene chloride and then with water. The extracts are then ready for screening for potential activity against HIV or cancer. One plant or animal can produce several extracts, and each extract may be made up of thousands of elements. Since the aim of this programme is to test thousands of plants and animals, traditional *in vivo* screening (in living animals such as rats and mice) "rapidly becomes unmanageable and prohibitively expensive", says Boyd. In addition, animal testing isn't as sensitive, so many promising compounds could be missed.

Boyd adds that the new screen also increases the chances of discovering novel agents that work against specific cancers. "That may be even more important than sensititivity", Boyd says. The new NCI anti-tumor screen uses 60 different human cancer cell lines, including ones for leukemia, melanoma, colon cancer, lung cancer, ovarian cancer, brain cancer, and kidney cancer. The cell lines, orginally developed from tumors taken from cancer patients, are kept frozen in liquid nitrogen, where they remain alive but dormant. Samples for screening are then revived (thawed) and cultured as needed. Substances found active against certain of the cancer lines in the *in vitro* screen are then tested *in vivo* against the same kind of lines implanted in laboratory mice. Although the process sounds simple, it's been a "five-year ordeal to

get the screen up and running", says Boyd. "The antitumor screen is truly unprecedented in its scope and complexity". During 1989, the screen was run primarily on known compounds to develop a basis for comparing test substances. Starting in 1990, the screening shifted to the thousands of samples stored at NCI's natural products repository. NCI researchers are also using the screen on new compounds submitted to NCI by cancer researchers worldwide.

One boost to the development of the anti-tumor screen has been the concurrent development of an anti-HIV screen. Because the genetic makeup of the AIDS virus is much simpler than that of the myriad of cancer cells, the anti-HIV screen is already being used to screen 1,000 samples a week.

Once an extract shows promise, the natural products chemistry lab separates the extracts into basic components. For example, a chemical process called high performance liquid chromatography turns the black, tarry-looking sludge into white powders and gold liquids. Then the screening process starts all over again on the various components isolated by the chemists.

The success of any of these natural products against disease could prove bittersweet if the plant can't be collected or grown in sufficient quantity or the extract can't be reproduced synthetically. Usually it is a portion to make these natural product compounds in the lab, explains Boyd. "Often (these extracts) are very inapproachable by known chemistry", he says. "They have very complex structures".

For example, taxol, an extract from the bark of the Pacific yew tree, is currently being tested in people as a treatment for ovarian cancer. But taxol "can't be made chemically", says Boyd, "so the challenge is to get enough of the trees". One solution, explains Boyd, may be to grow seedlings of the yew tree and "harvest" the taxol pruning the branches.

Meanwhile, collecting plants and marine organisms — both those with proven success and those with only promise and folklore to back them up — continues around the world. (*Courtesy: Science Update*).

SCIENTISTS TAME POISON TO FIGHT BLOOD CANCER

Scientists have harnessed one of the world's deadliest poisons in what they say is a promising new approach to hunting down and destroying cancer.

In the report from San Diego California, researchers said they used a modified version of the Ricin toxin to cleanse the body of malignancy in people treated for a form of blood cancer. They said the poison, which was welded to a disease-seeking antibody, appears to keep people disease-free after bone marrow transplants for cancer treatment.

"We view this as a very promising approach that will allow patients undergoing bone marrow transplants to have very substantial remissions", commented Dr. Richard L. Schilsky of the University of Chicago.

ZOFRAN DECLARED EUROPE'S TOP DRUG

Zofran (Ondansetron) manufactured by Glaxo U.K. has won one of the most prestigious drug prizes in the world — the first ever European Prix Galien Ondansetron for treatment of nausea and vomiting (emesis) associated with cancer therapy was voted Europe's top drug by six expert panels, consisting of clinicians, toxicologists, pharmacists and manufacturers from France, Belgium, Italy, Germany, Spain and the U.K.

The European Prix Galien is awarded to the pharmaceutical product judged to have made the most significant overall contribution to the European market in terms of efficacy, safety and innovation. The Prix Galien competition - sometimes considered the Noble Prize of the Pharmaceutical industry - originated in France in 1970 with the aim of promoting significant advances in pharmaceutical development and clinical research. The next European Prix Galien will be presented in Brussels to coincide with the single European market.

Ondansetron, brand name Zofran, was discovered in 1983 and after six and a half years' development, was launched in March 1990. Discovered and developed by Glaxo Group Research in the U.K. This 5-HT 3 receptor antagonist is undergoing clinical evaluation in India. (*Glaxo News*).

STRUCTURE DETERMINED FOR HORMONE - RECEPTOR COMPLEX

The structure of a protein-receptor complex — that of human growth hormone with the extracellular domain of its cell-membrane receptor — has been determined for the first time by A.M. Devos, M. Ultsch and A.A. Kossiakoff of the Department of Protein Enineering at Genentech, South San Francisco, California, USA (*Science*, 255:306 (1992)). The work is important because of the essential role of human growth harmone receptor binding in stimulating growth and metabolism of muscle, bone and cartilage cells. The crystal structure shows that binding of human growth hormone involves dimerization of two molecules of receptor protein. Signal transduction may occur by a mechanism in which this dimerization event induces formation of a site on the inside of the membrane that is capable of interacting with substrates or effector proteins in the cell. The receptor is a member of the hematopoietic family, a group of receptors involved in cell growth and differentiation. The family also includes receptors for the interleukins, granulocyte and granulocyte-macrophage colony-stimulating factors,

erythropoietin, and the interferons. The dimerization mechanism of signal transduction may apply to other hematopoietic receptors as well. (*C & EN*, Jan. 20, 1992)

STRATEGY ELICITS IMMUNE RESPONSE TO MANY HIV STRAINS

A highly variable region of the envelope glycoprotein of the human immuno deficiency virus (HIV), the V3 loop, evokes the major neutralizing antibodies to the virus and stimulates cytotoxic T lymphocytes (CTLs). The V3 loop of gp 160, therefore, is both an attractive candidate as a component of an AIDS vaccine and a problem for the design of useful vaccines because of its variability. Researchers in Japan & USA have shown that one position in the V3 loop, amino acid 325, is critical for recognition by HIV strain-specific CTLs. Their research demonstrates that CTLs to the IIIB strain of HIV tend to recognize an amino acid with an aliphatic side chain at this position, whereas CTLs to the MN strain of HIV respond to an aromatic amino acid or a ring structure at this position (*Science*, 255: 333 (1992)). The researchers also demonstrate that mouse spleen cells primed by exposure to HIV-IIIB gp 160 and restimulated by exposure to HIV-MN gp 160 modified at position 325 give rise to CTLs that are broadly cross-reactive with a number of HIVstrains. The experiments suggest an approach to AIDS immunization that might elicit CTLs that "protect against at least low-level exposure to a variety of HIV isolates", the scientists say. (*C & EN*, Jan 20, 1992)

SYNTHETIC POLYMER GEL ACTS LIKE ARTIFICIAL MUSCLE

Japanese researchers have demonstrated that a strip of synthetic polymer gel immersed in an aqueous electrolyte can bend and move in response to electrical stimulation as if it were an artificial muscle (*Nature*, 355: 242 (1992)). Yoshihito Osada and coworkers in the Chemistry Department at Ibaraki University describe how the gel strip supended at both ends from a ratchet bar, can be made to move with a worm-like motion at velocities upto 25 cm. per minute. The movements are caused by the selective binding of surfactant molecules to alternating sides of the gel. Like living organisms, this artificial chemomechanical system can transform chemical energy directly into mechanical work. Other groups also are using polymer gels, as the basis of chemomechanical systems for possible sensor/actuator applications (*C & EN*, Jan. 8, 1990 p. 30). Some fascinating instances are mentioned in the *Nature* issue. These examples include polymer gel fingers that can hold onto objects in air, a gel beetle that can crawl up an incline, and a gel-powered rotational micromotor. The study of such responsive gels "is still in its infancy" and "some potential problems" stand in the way before the gels can be incorporated into useful devices. (*C & EN*, Jan 20, 1992).

DIAL A DIALYSIS

Patients suffering from kidney failure can now do away with periodic visits to the hospital for dialysis. The British Technology Group (BTG) is backing a wholly implantable Continuous Ambulatory Peritonial Dialysis (CAPD) that will minimise travel to the hospital renal unit for dialysis. It offers those in need of dialysis more convenience, independence and mobility, plus a reduced risk of infection.

The system involves the permanent insertion of a catheter and pump underneath the skin to remove harmful substances such as urea from the blood through the simple process of diffusion.

The catheter drains into the peritonial cavity, while the pump, which is operated manually accesses the peritonial cavity and thus allows waste fluid to be shunted to the exit point in the bladder. From here the anatomy takes over. (*The Economic Times*, 18th April '92)

BIOTECHNOLOGY GAINS

There is money to be made in biotechnology especially in the USA. During 1990 American labs churned out as many as eleven new products into the market, while sales surged by 38% to hit the $4 billion mark. That has also made the total industry flourish with revenues of $5.8 billion.

The new crop of products which include both human medicines & vaccines have also helped investors feel secure about bio-tech laboratories as R & D institutions have begun delivering goods instead of just soaking up dollars — there has been a 75% rise in the industry's market capitalisation to $35 billion over 1990 alone. The number one turned out to be Amgen Inc. whose product Epogen (erythropoietin) earned $320 million in 1990. While that makes Amgen the first biotech company to make it to the Fortune 500 listing, it has also toppled to second place Genetech Inc's heart drug TPA. The sapling of biotech is finally bearing fruits. (*The Economic Times*, Oct 5, 1991).

LESSENING PAIN

Leaukaemia sufferers, so far, faced an agonising future. When detected they had to undergo painful trials with many drugs — to guage what was most effective & non-toxic medicine for them. Now, there appears to be some light at the end of this tunnel.

The Bath Cancer Research Group in south-west England, have pioneered a new technique to establish the patient's sensitivity to different drugs. The simple test involves taking cells from the patient by means of blood samples or biopsy, and testing the cells for sensitivity against the available drugs and radiotherapy. For the patient, of course, that means cutting out all those tortuous hours.

"CONTROLLING" DISEASE

Cell Adhesion Molecules (CAMs) are important compounds in our body. Without them, all organs, the skeleton and the flesh would not remain attached to each other. CAMs, like other body proteins are selective. They only stick to specific opposite numbers, called the integrins.

Integrins, present on cell surfaces wait for the suitable CAMs. But when CAMs run haywire, they cause myriad problems, eg., arthritis & spread of cancer. Scientists at the Manchester University are scrutinising the CAM-integrin reactions. By this study, they hope to control them.

One objective is to prevent, malignant cells from attaching themselves to a healthy one. And that could mean nipping many diseases right at the bud. Afterall, prevention is better than cure. (*The Economic Times*, Oct. 12, 1991).

CHLOROQUINE ANTIMALARIAL ACTIVITY EXPLAINED

The antimalarial drug chloroquine, one of the most successful antimicrobial agents ever produced, has been a boom to public health. Yet, until now, after nearly a half-century of use, we did not understand how chloroquine works.

New findings reported by biochemists at the Picower Institute for Medical Research in Manhasset, N.Y., reveal that chloroquine interferes with a unique enzyme that is essential to the survival of malaria parasites in the red blood cells they infect (*Nature*, 355: 167 (1992)).

The parasites digest the host cell's hemoglobin to get essential amino acids. But the digestion also releases large amounts of soluble heme, an iron porphysin that is toxic to the parasites. To avoid being poisoned, they polymerize the heme into an innocuous, insoluble material called hemozoin or malaria pigment, which is sequestered inside the parasite's food vacuole. The Picower researchers found that chloroquine and other antimalarials inhibit the enzyme that polymerizes (and detoxifies) heme. They are now trying to purify that enzyme. The research eventually may lead to new therapeutic strategies against malaria — an important goal since the main malaira-causing organism has become resistant to chloroquine and related to quinoline-based drugs. (*C & EN*, Jan 13, 1992, p. 20).

ENANTIOMERIC CHOLESTEROL TO PROBE ION CHANNELS

Ent-Cholesterol, the mirror image of cholesterol, has been prepared for the first time as a single isomer by chemists at the University of Minnesota to probe the role of cholesterol in cell membrane ion channels (*J. Am. Chem. Soc.*114:359, (1992)). The researchers used ent-cholesterol to study the activity of amphotericin B, an important antifungal agent thought to act by forming transient ion channels in sterol containing membranes. Enantiomers have identical physical properties in chiral environment, but they interact differently with chiral probe molecules. As such, it is possible to use enantiomers to distinguish between specific binding interactions between chiral molecules and nonspecific associations.

The researchers showed that amphotericin B produces ion channels possessing different properties in membranes that contain cholesterol or ent-cholesterol, thereby supporting the long-standing hypothesis that amphotericin B ion channels bind cholesterol. Because cholesterol plays a vital role in biochemical systems throughout the body, ent-cholesterol will be a valuable new probe to explore its function. (*C & EN*, Jan. 13, 1992, p. 20).

SPECIAL REPORT:

Customs Duties on Drug Intermediates Reduced

In exercise of the powers conferred by sub-section (1) of section 25 of the Customs Act, 1962 (52 of 1962), the Central Government, being satisfied that it is necessary in the public interest so to do, has exempted the goods specified in column (3) of the Table annexed hereto and falling within Chapter 28, 29, 30 or 39 of the First Schedule to the Customs Tariff Act, 1975 (51 of 1975), when imported into India for manufacture of bulk drugs specified in column (2) of the said Table, from so much of that portion of the duty of customs leviable thereon which is specified in the said First Schedule, as is in excess of 50 per cent ad valorem:

Provided that the importer furnishes an undertaking to the effect that:

(a) the said imported goods shall be used for the purpose specified above;
(b) an account of the said imported goods received and consumed in the place of manufacture for the aforesaid purpose shall be maintained by the manufacturer in the manner specified by the Assistant Collector of Customs;
(c) he shall produce the extract of such account duly certified by the said manufacturer evidencing receipt of the said imported goods in the premises of the place of manufacture within a period of 3 months from the date of importation or such extended period as the Assistant Collector may allow, and
(d) he shall pay on demand, in the event of his failure to comply with (a), (b) and (c) above, an amount equal to the difference between the duty leviable on such quantity of the said imported goods but for the exemption contained herein and that already paid at the time of importation.

Provided that nothing contained in this notification shall affect the exemption granted under any other notification of the Government of India for the time being in force from the duty of customs specified in the said Schedule in respect of goods referred to in this notification.

TABLE

Sl. No.	Name of the Bulk Drug (including its Salts & Esters)	Goods
(1)	(2)	(3)
1.	7-ADCA (for manufacture of Cephalexin/Cephadroxyl)	(a) Bis-Methyl Silyl urea (b) Pyridine hydrobromide (c) Peracetic acid
2.	Adrenochrome Mono Semicarbazone	DL-Adrenaline Hydrochloride
3.	Albendazole	4-Thiocyano 2-Nitro Aniline
4.	Amantadine	1-Bromo adamantane
5.	Amitriptylene	(a) Dimethylaminopropyl Chloride (b) Iminodibenzyl (c) Dibenzosuberenone
6.	Amoxycillin	(a) 2,6-Lutidine (b) Dimethyl Acetamide (c) Dimethyl Dichlorosilane (d) Pivaloyl Chloride
7.	Ampicillin	Dimethyl Dichlorosilane
8.	Astemizole	1-(4-Fluorophenyl) methyl-N-(4-piperidinyl)-1H benzimidazole 2-amino dihydrobromide

(1)	(2)	(3)
9.	Atenolol	(a) 4-Hydroxy acetophenone (b) 1-(4-Carbanoyl methyl)-phenoxy-2,3-Epoxypropane (c) 4-Hydroxy phenylacetamide
10.	Azethiprin	Hypoxanthine
11.	Beclomethasone	(a) Tri-ethyl/methyl orthopropionate (b) 17(1)21, Dihydroxy-16, betamethyl Pregna 1-4, 9 (11) triene 2, 20 dione 21 benzoate
12.	Betamethasone	(a) Methyl ortho valerate
13.	Buspirone	N-(2-Pyrimidinyl) Piperazine Dihydrochloride
14.	Caffeine (Synthetic)	N, N'-Dimethyl Urea
15.	Calcium Levulinate	Levullinic Acid
16.	Carbadox	Benzofuroxane
17.	Carbamazepine	Imino Di-benzylcarbonyl chloride
18.	Cephadroxyl	Tetramethyl Guanidine
19.	Cephalexin	(a) Trimethyl Chlorosilane (b) Hexamethyl Disilazane (c) Pivaloyl chloride
20.	Cephaloridine	7-ACA
21.	Cephalorin Sodium	Hexamethyl trisilazane or Trimethyl Chlorosilane
22.	Cephazolin Sodium	(a) 7-ACA (b) Dicyclohexyl Carbodiimide (c) Dimethyl acetamide (d) Ethyl orthoformate (e) 2-Methyl-5-mercapto 1, 3, 4-Thiadiazole (f) 1-H-Tetrazolyl-1-acetic acid
23.	Cephradine	D-alpha Dihydrophenyl glycine Dihydrophenyl glycine base or Dihydrophenyl glycine chloride HCl
24.	Chlorpheniramine Maleate	(a) 2 p-Chlorobenzyl Pyridine or p-Chlorobenzyl Cyanide or 2-Chloro pyridine (b) Dimethylamine Ethyl Chloride HCl (c) Dimethanolamine
25.	Chlorpromazine	2-Chlorphenothiazinone
26.	Cimetidine	(a) Thiophene (b) 5-Methyl-4-Hydroxy methyl Imidazole Dihydrochloride (c) 5-Methyl-(2-Amino ethyl-1-Thio methyl) Imidazole Dihydrochloride (d) Cyano-Dimethyl Dithiocarbamate (e) Cysteamine

(1)	(2)	(3)
27.	Cinnarazine	Cinnamyl Piperazine or Trans-Cinnamyl Chloride
28.	Ciprofloxacin	Methyl/Ethyl-3-Fluoro-4, 6-Dichloro Benzoyl Acetate
29.	Clidinium Bromide	3-Hydroxyquinolidine Base
30.	Clofazimine	4-Chloro-2-Aminodiphenyl amine
31.	Clomiphene Citrate	4-Hydroxybenzophenone
32.	Clopamide	Cis-2, 6-Dimethyl Piperidine
33.	Clotrimazole	Imidazole
34.	Cloxacillin	Ortho-chloro benzaldehyde
35.	Cyclophosphamide	3-Amino-1-propanol
36.	Cyproheptadine	(a) Dibenzosuberenone (b) 4-Chloro-1-Methyl Piperidine HCl
37.	Danazol	Androstenedione
38.	Desogestrel	17-Delta-11, 18-Acetone-19-nor-delta-4-androsten
39.	Dexamethasone	(a) Diosgenin (b) N-Bromo succinimide (c) 1, 3-Dibromo 5, 5-Dimethylhydantoin
40.	Dextromethorphan HBr	(a) 1, 2, 3, 4-Tetrahydroisoquinol (b) 3-Methoxymorphinan
41.	Dextropropoxyphene	(a) Propiophenone (b) Dimethylamine
42.	Diazepam	2-Amino-5-Chloro Benzophenone
43.	Diclofenac	N-Phenyl-2, 6 Dichloroaniline
44.	Diethyl Carbamazine Citrate	(a) N-Methyl Piperazine (b) Diethyl Carbamoyl Chloride
45.	Diflunisal	Isoamyl Nitrite
46.	Diloxanide	(a) Furfural (b) Furoic Acid
47.	Diltiazem	Beta-Amino Thiophenol
48.	Dimenhydrinate	8-Chlorotheophylline
49.	Diphenhydramine	(a) Diphenylmethane (b) Dimethyl Amino Ethanol (c) Diphenylmethyl Alcohol
50.	Dipyridamol	(a) 5-Amino orotic Acid (b) 2, 6-Dichloro-4, 8-Dipiperidinopyrimido-(5, 4-d) pyrimidine
51.	Di-Iodochlorohydroxy quinoline	8-Hydroxy Quinoline

(1)	(2)	(3)
52.	Doxycycline	(a) N-chloro succinimide (b) Triphenyl phosphine
53.	Enalapril	L-Proline
54.	Ethambutol	Tartaric Acid
55.	Famotidine	(a) N-4 (2-Cyano-ethyl) thio Methyl-2-thiozolyl Guanidine (b) Sulfurylamide (c) 3-(2-Guanidino thiazol-4-yl Methylthio) propionitrile HCl
56.	Fenbendazole	(a) 2-Nitro-5-Phenyl Thioaniline (b) 5-Chloro-2-Nitro Aniline (c) Thiophenol
57.	Fluocinolone	6-Fluoroepoxide
58.	Flurbiprofen	o-Fluoro Aniline
59.	Folic Acid	(a) Sodium Cyanide (b) Sodium metal (c) p-Nitrobenzoic acid
60.	Furazolidone	9a) 3-Amino oxazolidone sulphone (b) 5-Nitro-Furfurylidene 2-diacetate (c) Dinitro-2-Furfuraldehyde diacetate
61.	Glibenclamide	(a) 5-Chloro Salicylic Acid (b) 5-Chloro-2-Methoxy Benzoic Acid (c) 5-Chloro-2-Methoxy Benzoic Chloride (d) 2 Methyoxy 5-Chloro Benzamide (e) Beta Phenylethylamine (f) Acetyl Beta Phenylethylamine (g) Cyclohexyl isocyanate
62.	Guaiacol Glyceryl ether	Guaiacol
63.	Guanethidine Sulphate	Cyloheptanone
64.	Haloperidol	(a) 4-(4-Chloro Phenyl) 4-Hydroxy Piperidine (b) 4-Chloro-4-Fluoro-Butyrophenone
65.	Hydrochlorothiazide	m-Chloroaniline-di-sulponamide
66.	Hydrocortisone	4-Hydroxyandrostendione
67.	Ibuprofen	(a) Isobutyl Benzene (b) p-Isobutyl acetophenone
68.	Indomethacin	(a) N-(p-Chlorobenzolyl) N'-(p-methoxyphenyl) Hydrazine (b) p-Chlorobenzoyl chloride (c) Levulinic acid
69.	Iodo-Chlorohydroxy Quinoline	8-Hydroxy Quinoline
70.	Isoniazid/INH	(a) 4-Cyano Pyridine (b) Gamma Picoline

(1)	(2)	(3)
71.	Isoxsuprine	(a) 2-Amino-3-(p-hydroxyphenyl) Propane-3-01 (b) Bromopropyl Phenyl ether (c) Phenoxy acetone
72.	Ketamine Hydro chloride	(2-Chlorophenyl) Cyclopentyl Ketone
73.	Ketoconazole	(a) 4-Hydroxy Phenyl Piperazine or 1-Acetyl-4-(4-Hydroxyphenyl) Piperazine (b) CIS-2-(2, 4-Dichlorophenyl)-2 1H-(imidazole-1-yl-methyl) 3-Dioxolan-4 Methane Sulfonate/Chlorohydrate
74.	Levamisole/Tetramisole	(a) Thiazolidine Ethanol HCl (b) Phenacyl Bromide (c) 2-Amino Thiazolidine (d) Styrene Oxide (e) D-Camphor Sulfonic Acid (f) Alpha Phenyl-Aziridinyle-ethanol (Thiazolidone) (g) 3-Imido alpha phenyl thiazolidine
75.	Lignocaine/Lidocaine	(a) Chloro Acetyl Chloride (b) 2, 6-Xylidine
76.	Loperamide	(a) 4-(4-Chlorophenyl)-4 Hydroxypiperidine Hydrochloride (b) N,N-Dimethyl-2-Imino-3, 3-Diphenyl Tetrahydrofuran Iodine (c) Dihydro-N, N-Dimethyl-3, 3-Diphenyl-2-Furfurylidene Ammonium Bromide (d) 4-Bromo-N-Dimethyl-2, 2-Diphenyl butyramide
77.	Lorazepam	2-Amino-2, 5-Dichloro Benzophenone
78.	Mebendazole	(a) 3, 4-Diamino benzophenone (b) 4-Chloro-3-nitro benzophenone (c) 4-Amino-3-nitrobenzophenone (d) 4-Chloro 3-nitro benzoic acid (e) p-Chlorobenzoic acid (f) Thiourea (g) Methyl Chloroformate (h) Amino methoxy methylene carbamic acid methyl ester (i) 2-Methyl Pseudothiourea-1, 3-dicarboxylic acid dimethyl ester
79.	Mebhydroline	(a) Phenyl Hydrazine (b) N-Methyl-4-Piperidone
80.	Mefenamic acid	(a) 2, 3-Xylidine (b) Ortho-Chloro benzoic acid
81.	Methocarbamol	Guaiacol
82.	Methyl Dopa	(a) Vanillin (b) Veratraldehyde (c) 3, 4-Dimethoxy Phenylacetone (d) 2-Chloromethyl Propionate (e) Nitroethane

(1)	(2)	(3)
83.	Metoprolol	4-(2-Methoxy Ethyl) Phenol
84.	Mianserin	2-Amino Benzyl Alcohol
85.	Miconazole	(a) 2, 4-Dichloro benzyl chloride (b) Tri-n-butyl methyl Ammonium chloride (c) Imidazole
86.	Minoxidil	(a) m-Chloro Perbenzoic Acid (b) 2, 4-Diamino-6-Chloropyrimidine
87.	Nalidixic Acid	(a) Ethoxy methylene Malonic Acid diethyl ester (EMME) (b) 2-Amino-6-Picoline
88.	Naproxen	(a) 2-Bromo-6-methoxy naphthalene (b) 2-Methoxy-6-Acetyl Naphthalene (c) 6-Methoxy-2-Naphthylacetic acid methyl ester (d) N-Methyl glucamine
89.	Nifedipine	o-Nitrobenzaldehyde
90.	Nitrofurantoin	1-Amino hydantoin
91.	Nitrazepam	2-Amino-5-Nitrobenzophenone
92.	Norfloxacin	(a) 3-Chloro-4-Fluoro Aniline (b) Methylene malonic acid Di-ethyl Ester
93.	Ofloxacin	(a) Triethylorthoformate (b) 2, 6-Dichloro Aniline
94.	Omeprazole	(a) Metachloro perbenzoic Acid (b) 2-Hydroxymethyl-3, 5-dimethyl-4-methoxy pyridine HCl (c) 2-Mercapto-5-Methoxybenzimidazole
95.	Oxycycline	Methacycline
96.	Oxyphenbutazone	p-Hydroxyhydrazobenzene
97.	Oxytocin	(a) Protected Hexa-peptide (b) Nona-peptide (c) Tri-peptide hydrazide
98.	Panthenols/Pantothenates	3-Aminopropanol
99.	Papaverine	Dimethoxy Phenyl Acetonitrile
100.	Parabens	Para Hydroxy Benzoic Acid
101.	Penicillin G	Phenyl Acetic Acid & its salts
102.	Pentoxyfylline	Theobromine
103.	Pheniramine	Benzyl Pyridine
104.	Phenobarbitone	(a) Ethyl-(o-Cyano, o-ethyl, o-Phenyl) acetate (b) Benzyl Cyanide (c) Sodium metal

(1)	(2)	(3)
105.	Phenformin	Beta Phenyl Ethylamine
106.	Phenylbutazone	Hydrazobenzene
107.	Pindolol	4-Hydroxy Indole
108.	Piroxicam	(a) 4-Hydroxy-2-Methyl-2H-1, 2-Benzothiazine-1, 1-Dioxide-3-Carboxylic Acid Methyl ester (b) 2-Aminopyridine
109.	Povidone-Iodine	Polyvinyl pyrrolidone (PVP)
110.	Primaquine	(a) Nitro-para-anisidine (b) Dibromopentane (c) Phthalamide
111.	Promethazine-theolate	8-Chlorotheophylline
112.	Propranolol	Mono isopropylamine
113.	Pyrantel	(a) Thiophene-2-carboxaldehyde
114.	Pyrazinamide	(a) Diaminomalono nitrile (b) Dicyanopyrazine (c) 2-Methyl Pyrazine or Quinoxaline
115.	Pyrimethamine	p-Chlorobenzyl Cyanide
116.	Ranitidine	(a) Furane 2-Hydroxymethyl-5-Dimethylamino methyl (b) 5-Dimethylaminomethyl-2-(2-aminoethyl thiomethyl) furane i.e. cistopher (c) N-Methyl-1-Methylthio-2-Nitro ethenamine (d) Dithiomethyl Nitroethane (e) Nitromethane (f) Cysteamine Hydrochloride
117.	Rifampicin	Sodium diethyl barbiturate
118.	Salbutamol	(a) p-Hydroxy acetophenone (b) Sodium Borohydride (c) N-Benzyl Tertiary butylamine
119.	Sucralfate	(a) Sucrose Octosulfate Potassium (b) Aluminium chlorohydroxide/hydroxychloride
120.	Sulbactam Sodium Ester/Pivaloyl	6, 6-Dibromo Penicillanic acid
121.	Sulfadiazine	2-Aminodiazine
122.	Sulfamethoxazole	(a) Hydroxylamine Sulphate (b) Diethyl Oxalate
123.	Sulfathiazole	2-Amino Thiazole
124.	Sulphadimidine	Acetylacetone
125.	Terbutaline	(a) 3, 5-Dibenzyl Oxyacetophenone (b) Betahydroxy Ethyl Hydrazine

(1)	(2)	(3)
126.	Testosterone	Androstenedione
127.	Theophylline Ethanoate of Piperazine	2-Theophylline Acetic Acid
128.	Theophylline/Aminophylline	(a) Amino Uracil (b) Dimethyl Urea
129.	Thiopentone Sodium	Diethyl-ethyl (1-methyl Butyl) Malonate
130.	Thioridazine	Methyl Mercapto Phenothiazine
131.	Ticlopidine	2-Thiophene Ethanol
132.	Timolol	Tertiary Butyl Amine
133.	Tinidazole	(a) Ethyl Thioethanol (b) Ethyl Sulphonyl-ethanol
134.	Tolbutamide	n-Butylamine
135.	Tolnaftate	(a) Thiophosgene (b) 2-Naphthyl Chlorothioformate
136.	Triamcinolone	(T-IB) 11 Beta 21-Dihydroxy Pregna 1, 4, 16-Trione-20-dione, 21-Acetate
137.	Trifluoperazine	(a) 2-Trifluoromethyl Phenothiazine (b) 1-(3-Chloropropyl)-4-Methyl Piperazine
138.	Trimethoprim	(a) 3,4,5-Trimethoxy Benzoic Acid (b) Morpholine (c) Morpholinopropionitrile (d) Guanidine HCl
139.	Verapamil	(a) Diphenyl Acetonitrile (b) Dimethoxy Phenyl Acetonitrile (c) 1-Bromo-3-Chloropropane (d) Homoveratrylamine
140.	Vitamin B1	(a) Acetobutyrolactone (b) Sodium metal
141.	Vitamin B2	Barbituric Acid
142.	Vitamin B6	(a) Cis-Butenediol (b) DL-Alanine (c) Isobutyraldehyde (d) 4-Methyl-5-Ethoxazole
143.	Vitamin E (alpha-Tocopherol)	Isophytol
144.	Vitamin K	Beta-Methyl Nephalene

(Source: IDMA Bulletin, May 14, 1992)

SPECIAL REPORT

ASSOCHAM-IMC delegation sees rich prospects in South-East Asia

India has witnessed a spate of economic, industrial and trade reforms, geared towards achieving an integration of Indian economy with the world economy. However, a lot more needs to be done to create an awareness among the foreign buyers and investors about these reforms, besides developing a proper marketing strategy.

As a follow-up of these reforms, a 17-member Business Mission sponsored by ASSOCHAM-IMC, visited Thailand, Malaysia, Indonesia and Singpore from 26th March to 5th April, 1992. The Mission was led by **Mr. Tanil R. Kilachand,** President of IMC and Deputy President of ASSOCHAM. Apart from 12 businessmen, the Mission consisted of **Mr. Ashok Jha** , Joint Secretary in the Ministry of Commerce and representatives of development and financial institutions such as Exim Bank, ICICI, GIIC, Bank of Baroda and Deutsche Bank. Other members of the delegation included: **Mr. Pramod M. Chaudhari,** Chairman & Managing Director, Praj Counseltech Pvt Ltd.; **Mr. Dipak Himatsingka,** Managing Director, Amines & Plasticizers Ltd.; **Mr. Suresh Kotak,** Senior Partner, Kotak & Co.; **Mr. H.H. Malgham,** Director - Corporate, Tata Exports Ltd.; **Dr. Prakash A. Mody,** Managing Director, Unichem Laboratories Ltd.; **Mr. Mahendra V. Shah,** General Manager, ICICI; **Mr. K. Sadashiv,** Resident Representative, Export-Import Bank of India; **Mr. Jahangir M. Chagla,** Indian Dyestuff Industires Ltd; **Mr. S.V.R. Nair,** Asst. General Manager, Bank of Baroda; **Mr. Ashok M. Kadakia,** Chairman & Managing Director; Ashok Organic Industries Ltd.; **Mr. S. Krishnan,** Resident Manager, Gujarat Industrial Investment Corporation Ltd.; **Mr. Chandrasinh H. Mirani,** Managing Director, India Gelatine & Chemicals Ltd.; **Mr. Manilal Premji,** Partner, Premji Bhanji & Co.; **Mr. Harkirat Singh,** Dy. Chief Executive Officer, Deutsche Bank AG; and **Mr. P. N. Mogre,** Secretary, IMC.

The Mission represented the following four specific groups:

* Chemicals, dyes and pharmaceuticals

* General Trade with specialisation in exports of yarn, textiles, foodstuffs and agro-based products.

* Financial Service, Invester Services, Trade Finance, Banks and Mutual Funds.

* Project management, Engineering Goods and Consultancy Services.

The main objectives of this Mission were:

-- To acquaint the business community abroad with the economic reforms introduced by the Government of India in the areas of industrial policy, trade policy, economic policy, foreign investment and collaborations and financial services, etc.

-- To acquaint the foreign businessmen with the new opportunities in the areas such as: two-way trade and joint ventures (focus on domestic market in India), joint ventures (focus on third country markets), and setting up 100% export-oriented units and buy-back arrangements (possible shifting of production base to India by multinationals).

-- Portfolio investment opportunities in India by foreigners (via off-shore funds).

-- Special facilities for NRIs (joint ventures, EOUs, Portfolio investments, etc.).

The Indian Diplomatic missions in these countries had drawn a comprehensive programme in co-operation with the leading local chambers of commerce and concerned organisations, which consisted of seminar on "Economic Reforms in India — Emerging Prospects for Two-way Trade, Economic co-operation and Joint Ventures" followed by one-to-one business meetings, covering the four specific areas. The programme included briefing by Indian Ambassadors/High Commissioners, call on the Minister/Secretary for Industry, Minister/Secretary for International Trade, Meetings with Board of Trade/Board of Investment, Meeting with members of leading local chambers of commerce, meeting with representatives of banks and financial institutions, mutual funds and meeting with NRIs, important Chinese and local business leaders, etc.

Discussions at meetings were meaningful and constructive. The Mission received an excellent response from Indian Diplomatic Missions, Chambers of Commerce, Association of Bankers and NRIs in these countries. Many members of the Mission could establish new contacts, renew old ones and some of them had successful business deals. The most significant and important landmark of the Mission's visit was ASSOCHAM-IMC signing MOUs with the following organisations:

-- Indonesia Chamber of Commerce & Industry
-- Singapore Chinese Chamber of Commerce & Industry
-- Singapore Indian Chamber of Commerce.

On the occasion of this visit, the Chamber brought out a publication titled 'ADVANTAGE INDIA' highlighting reforms introduced in the economic, industrial, trade and financial fields and how the investment climate has become conducive in India. It also contained profiles of thrust sectors of Indian industry such as: project management/engineering consultancy, engineering industry, computer software, chemical industry, dyestuff and dye intermediates, drugs and pharmaceuticals industry, textile industry, carpet and floor coverings, leather and leather products, agro products, Indian granites, development banking and project finance and what they offer by way of two-way trade, economic co-operation, transfer of technology and joint ventures in these countries. A Directory of Indian Companies interested in setting up business tie-ups in South East Asia had also been brought out. These copies were distributed at seminars/meetings held in these countries. A video film brought by the Ministry of External Affairs, depicting the reforms was screened. The Mission was highly successful in projecting the image of new India to the business and industry in these countries and improved climate for foreign direct investment, investment in Indian capital market.

AN OVERVIEW OF ASEAN

The Association of South East Asia Nations (ASEAN) over the last 25 years has developed into a mature group of six nations viz. Thailand, Malaysia, Indonesia, Singapore, Philippines and Brunei, safeguarding their economic and strategic interests. Not only has it been able to develop balanced relationship, it has also succeeded in making economically strong nations, strengthen interests in this region.

This region has been the fastest growing area in the world in the last one decade. Indonedsia, Malaysia, Thailand and Singapore had an average annual growth rate of 8 per cent during eighties, all because of substantial foreign investments by Japanese and Taiwanese. The two have been investing more than US$ 10 million a year. The market comprises 300 million consumers with good purchasing power. The economic growth in Asia-Pacific region will remain the world's highest at 6.7 per cent in 1992 as against 6.2 per cent last year, according to the United Nations Report.

In developing India's response to a rapidly changing international economic scenario, there is every reason to pay greater attention to the changes that are taking place within the ASEAN. The process of consolidation that has now been taking place within ASEAN can well change international economic relations to a degree that India cannot ignore. These nations have begun to prepare themselves for the possibility of multilateral trading system being replaced in the near future by a system dominated by trade blocs. There has been little hesitation among the ASEAN nations in moving towards the creation of ASEAN FREE TRADE AREA (AFTA). Indeed, the target set in the Singapore summit to reducing tariffs on 15 groups of items to less than 5% is widely accepted to be achieved before the end of scheduled 5-year period.

With a view to integrating Indian economy with global economy, the economic reforms introduced in India has aroused a lot of interest in these countries. They do feel that India not only provides a large market which the ASEAN is looking for but also provides investments and technology opportunities at much cheaper rates than the West and Japan. It would be in India's interest to look for a wider and intensive participation in the economic activity in the ASEAN region, so that in future both ASEAN and SAARC could work together towards forming an effective ASEAN market.

HIGH POTENTIAL FOR TWO-WAY TRADE, ECONOMIC CO-OPERATION & JOINT VENTURES

Country-wise Areas Identified

In each country, members of the Mission had individual business meetings with their counterparts. After detailed discussions, following areas were identified by the Mission:

Thailand

* Thailand has embarked on 6th Economic Plan in which major emphasis is given on development of six industries viz. electronics, petro-chemicals, iron and steel, machinery, textiles and agro-based industries. They are looking forward to setting up more joint ventures in these areas, technology transfer and modernisation of the existing units. Since Indian Industry has made notable progress and acquired experience and expertise in these areas, India can avail of these opportunities by way of setting up joint ventures or technology transfer.

* A concept of joint venture export trading company with Thai equity can also be explored to market the products in the neighbouring countries.

* Alcohol-based chemicals are a substitute for petroleum derived products. India has well developed alcohol-based chemicals industry. Thailand is exporting molasses at present. Indian chemical industry can help in manufacturing alcohol and alcohol-based chemicals from the molasses.

* Sugar mills in Thailand are undergoing a programme of mordernisation. Indian sugar mills and sugar mills machinery manufacturers can participate and help the modernisation of sugar mills in Thailand.

* India and Thailand are both producers and exporters of textile goods. However, the spinning sector in Thailand is not as developed as their weaving and knitting sector. As com-

pared to Thailand, India is in an advantageous position with regard to availability of raw cotton, modern spinning and weaving mills and sophisticated indigenous textile machinery. Since Thailand has to depend on imported yarn, fully export oriented modern spinning mills could be set up in India to export yarn to Thailand, which could be used by their weaving and knitting sectors for finally producing a variety of textile items for exports.

* Similarly, pharmaceutical and bulk drug industry in Thailand is in the process of upgradation and modernisation. The Indian drug and pharmaceutical industry can effectively participate by way of setting up joint ventures, technology transfer and marketing of their products in South East Asia.

* Thailand has the largest fishing fleet in the world and it has developed expertise in both fisheries and sea food processing. Considerable scope exists for collaboration between India and Thailand in these areas. With liberalisation of joint venture procedures and opening up of India's exclusive economic zone, many Indian companies can negotiate with Thai fisheries. In the area of shrimp farming, both marine and fresh water, Thailand can supply expertise and technology to India.

* Though India has 16 joint ventures in Thailand, the Mission identified that there are more promising areas for joint ventures between the two countries. They are vegetable oil processing, machine tools, pigments for paints, agricultural machinery, D.G. sets and transformers, textile fabric printing and dyeing, castings and forgings, road construction, hotel projects, engineering design and consultancy services, etc.

Malaysia

* At present Malaysia is looking for joint ventures in fields such as: construction, electronic equipment, computer equipment, plastics and rubber industries and information technology. Indian companies can set up joint ventures with the help of Malaysian companies in these areas for marketing products to other countries.

* Apart from the present 19 joint ventures, there are good prospects for more Indian companies to set up joint ventures in other areas that include: palm oil, petroleum products, timber, rubber, transport equipment, electronic appliances, drugs and pharmaceuticals, food products, agro-based commodities and glasses.

* Similarly, there is also a lot of scope to attract investment in the engineering sector in Malaysia, especially in areas such as: automotive components, industrial and intermediate products, industrial machinery, steel foundry, steel castings, metalwork, machine tools, etc.

* The IMC Mission was informed that shortly a delegation of about 200 leading industrialists, led by the Prime Minister of Malaysia, would be visiting Vietnam to set up joint ventures in the areas of telecommunication, road construction, shipping services, etc. and there are good scope for Indian companies to join hands with Malaysian companies in setting up joint ventures in Vietnam and Cambodia.

* A concept of joint venture export trading companies with Malaysian equity needs to be encouraged.

* NRIs settled in Malaysia pointed out that with the opening of Indian economy, they are very keen to invest in Indian capital market but cumbersome and complicated procedures are coming in the way. If a mechanism is evolved whereby they can buy or sell shares through any one of the recognised banks, this will go a long way in attracting investment from NRIs into Indian capital market. Under no circumstances, should NRIs be made to approach any other authorities in India.

Indonesia

Indonesia is one of the few countries with which India has favourable balance of trade. The potential for expansion is however considerable. Some of the items identified by the Mission for further improvement in exports to Indonesia are as follows:

* Due to delayed rains this year and drought conditions last year, Indonesia is expecting a shortfall in some of its crops such as wheat, sugar, rice, tobacco, etc. We should explore the prospects for exports of these items to Indonesia if supplies are available in India.

* Chemicals and pharmaceuticals could be exported to Indonesia as at present Indonesia is importing these items.

* As per the 1990-91 deregulation package announced by the Government of Indonesia, imports of a large number of items such as fruits, meats, paints, cold rolled steel, sheets and tin plates and automobile components have been liberalised.

* At present, Indonesia is importing the following items in large quantities from other countries. Indonesia can import them from India provided we can supply quality goods in good packaging condition at reasonable and competitive prices with assurance of regular and adequate supplies. These include cotton, dyestuffs and chemicals, textile and leather machinery, auto parts, animal-feed, iron ore and

concentrates, aluminium ore, power equipment and engineering goods. Other items where Indian exporters could direct their efforts can be wheat, cement, commercial vehicles, thermal power equipment, electronic parts, micro chips, computer software, cables, hydraulic machine tools, mining equipment, offset printing machiney, regenerators, pulp making and processing machinery, laboratory equipment such as soil testers, etc.

* In any export promotion exercise, it is important to participate in specialised Fairs/Exhibitions. A number of these are held in Indonesia covering areas of Indian interests such as machine tools, electronic components, textile machinery, business and office equipment, power sector equipment and machinery automobile parts, etc. It is important that Indian companies engaged in these activities are encouraged and given necessary incentives to participate in the Fairs/Exhibitions.

* The Mission identified following areas for joint ventures: Shipbuilding, marine products and value added services, paper and rayon, textiles, chemicals and pesticides, drugs and pharmaceuticals, pump-sets, solar systems, telecommunications, development of tourism and gem and jewellery. Alcohol-based chemical units could be set up since molasses is available in plenty in Indonesia. The concept of joint venture export trading companies with Indonesian equity needs to be encouraged.

* It was felt that both India and Indonesia could join hands in enhancing their competitive advantage in global market in many fields.

* It was time and again pointed out that there is need for South-South cooperation and that India and Indonesia should reassess their complimentarities and capabilities and take bold steps towards industrial collaborations in these areas to assure a fair share of the world market. They can come closer in not only promoting trade and joint ventures between the two countries but also catering to the needs of third markets. There is a lot of goodwill for India, and Indonesia is looking forward to profitable and fruitful commercial ties with India.

Singapore

* All sections viz. Government, business, industry and financial institutions in Singapore appreciated the recent economic reforms initiated by the Government of India to integrate the Indian economy with the global economy and also welcomed India becoming a sectoral partner of ASEAN. They feel that these developments should help forge greater co-operation between Singapore and India, which would benefit the region as a whole.

* India should use Singapore as a gateway for its global trade and for seeking new technologies and investments.

* For access to world markets, India needed to produce world class products, and must incorporate the latest technology and design to get into the homes of consumers the world over. If India had a presence in Singapore, it could then use Singapore for sourcing with its strong infrastructure and trade links throughout Asia and Pacific region. More than 50 multinational companies including IBM and Mitsubishi have their offices in Singapore. These MNCs use Singapore as an operating headquarter to promote their exports to other regions. It was strongly felt that India should follow in the footsteps of many MNCs which had their headquarters in Singapore and use it as a base to widen their operations to other regions. Presenc e in Singapore would also help receive a continuous stream of technology inputs and latest innovations in technology.

* With the introduction of a programme of liberalisation, India has started attracting the attention of MNCs and Singaporean companies for investments but at the moment countries like China, Cambodia and Vietnam are receiving greater attention. However, India will have to compete with other ASEAN countries and provide a comparative advantage to attract more and more investment. Singapore is facing shortage of land and labour and, therefore, Singaporean manufacturers are moving out to other countries like Vietnam, Malaysia, Thailand. Now India has been added to this priority list. It was emphasised that Singapore businessmen can take advantage of new environment in India and forge collaborations with Indian businessmen specially in the fields of manufacturing, trading, services, management consultancy in the area of infrastructure management, construction, port management, urban management, financial services and investment in capital market.

* Indian and Singapore businessmen could evolve a strategy partnership to manufacture items which could penetrate ASEAN markets using Singapore as a spring board. A concept of joint venture export trading companies with Singaporean equity needs to be encouraged.

* Twenty-first century is a century of Pacific countries and Singapore not only offers a market around but through the Pacific right upto the USA.

* Areas identified for joint ventures between India and Singapore are: Air-conditioning and refrigeration, ship-building, oil exploration, textiles, chemicals, foodstuffs, electronic products, machine and machine tools, computer software and engineering products as also finance, banking, investment and leasing. Singapore can also help in pro-

APPOINTMENTS/CLASSIFIEDS

viding technology and capital to its Indian counterparts for the development of hotels and tourism, building contracts and offshore construction. A variety of industries, including electronics, were reportedly being phased out from Singapore due to high domestic operating costs. Low labour costs in India and easy availability of vast labour force, skilled, semi-skilled and unskilled, could offer excellent opportunities to Singapore to arrange transfer of these industries to India with possible buyback arrangements. This would provide Singapore an edge for marketing such products in the international markets.

After detailed discussions with the counterparts in business and industry of these four countries, the Mission felt that since specific areas for mutual co-operation have been identified, the Chambers of Commerce and other concerned organisations should sponsor more product-specific delegations for transacting the business.

Information exchange and data banks should be developed between Chambers of Commerce on import-export items, technology and services, including developments in the financial sector. A prompt exchange of information on a continuous basis will go a long way in helping business and industry in both the countries to realise their true potential and further promote the bilateral trade and economic co-operation.

MESSAGE & LESSON FOR INDIA

From discussions with various authorities and businessmen, the Mission got a clear and practical message from business and industry in these countries as to what more needs to be done in India, which is as follows:

"Indial impression about various economic reforms announced in India is good but they are sceptical about their implementation by the Indian bureaucracy. We must galvanise and energise our people, systems and style of functioning so that things move faster in our country. If we want to attract foreign investment on a big scale, we must give them a feeling of total welcome and red carpet treatment as has been done by our competitors. They should deal with only one agency in India and approvals must be given within 4 to 6 weeks. If we are able to show that after introduction of economic reforms, a few projects have been cleared fast and implemented on time, they will be our success stories and convey a right message to other potential investors to come to India."

New Horizons in Petrochemicals

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The Baroda Regional Centre of the Indian Institute of Chemical Engineers had recently held a two-day national seminar on 'Petrochemicals — Emerging Technologies' in Baroda on February 21 and 22, 1992. The inaugural address of the seminar was delivered by Prof. M.M. Sharma, Director, U.D.C.T., Bombay.

The evolution of the petrochemical industry, the shape of things to come, and the priorities for development and research were the scope of his address, which is reproduced below:

Ethane and propane in natural gas and associated gas will play a very important role in making available more ethylene and propylene. The catalytic dehydrogenation of propane and isobutane will emerge as important technology and it is likely that dehydrogenation/oxidative dehydrogenation of ethane, on a modest scale, will also become important. The direct conversion of ethane to vinyl chloride and propane to acrylonitrile and acrylic acid will receive attention. The possible selective oxidation of ethane to acetic acid and other products offers attractive features. Oxidation of butane to maleic anhydride will be further improved.

The revised specification of motor gasoline will make available C_5s (virgin and cracked) and benzene on a large scale. Tertiary amyl methyl ether (TAME) and the related tertiary amyl ethyl ether will become important additives for gasoline. Liquid phase oxidation of C_5's may well become important. Utilization of C_5 olefins (besides isoamylenes) should receive attention. Methyl tertiary butyl ether (MTBE) based on catalytic dehydrogenation of isobutane, with reactor-separator configuration, will emerge as an important technology. We should pool C_4 fraction from two or three catalytic crackers (like Mathura and Koyali) and make butadiene, at least on a scale of 50,000 tpa, via oxidative dehydrogenation.

The selective hydrogenation of benzene to cyclohexane will open up new vistas, as cyclohexanol (and hence cyclohexanone and the corresponding oxime or oxidation product adipic acid) can be conveniently made directly in an efficient way, by passing the hazardous and somewhat inefficient oxidation technology based on cyclohexane.

Polymerization of ethylene and propylene will witness further breakthroughs in terms of more efficient and clean technology and making possible manufacture of copolymers which could also be thermoplastic elastomers. Polypropylene of superior grades, including those grades which permit soft, flexible products to be made, will emerge and may well displace a lot of plasticised PVC where expensive plasticisers are used and which also pose problems of migration.

There is a possibility that in-line two stage polymerization reactors for ethylene will emerge, where selective oligomerisation will allow co-monomers (butene-1, hexene-1 and octene-1) to be made first, followed by copolymerization with ethylene. The oligomerisation of ethylene to alpha olefins will probably become more selective with the elimination of C_{18+} α-olefins.

New co-polymers of ethylene and carbon monoxide, which are engineering plastics having properties comparable to polyamides, are likely to emerge.

The dehydrogenation of ethyl benzene to styrene will be made more efficient and combo separator-reactors for polystyrene via anionic polymerization will emerge, and this will also permit thermoplastic elastomers to be made on a much larger scale. Ethyl benzene will also be made via alkylation with ethane-ethylene mixtures using zeolite catalyst.

We ought to plan a large plant (possibly 100,000 tpa) for acrylonitrile and the co-product HCN should be utilised for making adiponitrile, in-turn to be converted to hexamethylene diamine required for polyamides and urethanes. A large size phenol plant (possibly 100,000 tpa) should also be put up in the near future.

Non-phosgene based routes for polycarbonates and urethanes are likely to become commercially attractive. Here the trans-esterification, to make the relevant carbonates, with ethylene and propylene carbonate, will become important. Ethylene/propylene carbonate can easily be made by the direct reaction of CO_2 with ethylene oxide/propylene oxide. Even dimethyl carbonate can be made by trans-esterification of methanol with ethylene/propylene carbonate. Engineering plastics will systematically replace metals and alloys and more functional blends and alloys will emerge.

The stringent specifications of diesel oil (and even aviation turbine fuel) will make available alkylated naphthalenes which can not only be converted to naphthalene, but could also be possibly directly upgraded to plasticisers for cement-concrete.

Separation processes will have to function to provide purer materials consuming lesser energy. Adsorptive separations may be the next distillation. Energy integration in the entire complex will become a necessity. Further, zero discharge will become a norm.

The future of petrochemicals is very bright in India in view of linkages with the basic necessities of life. However, we need to quickly gear up to produce at least 2 million tonnes per annum of ethylene, a figure which China has already crossed. Petroleum refineries should produce xylenes, cumene and cyclohexane through proper use of hydrogen and other facilities.

We in India should also embark on export of petrochemicals in an aggressive way not only as a flywheel but also as a deliberate strategy. Benzene, *o*-xylene and *p*-xylene and products based on them should receive special attention; finished fabrics based on polyester fibre/yarn should be promoted on a grand scale. All our new plants should be internationally competitive. To ensure that all the downstream plants work independently of the olefins complex we ought to have an import terminal with pipeline network for ethylene from near Nagothane to Thane-Belapur Road, which can then be extended to Hazira/Vadodara (Hazira has import facilities). The investment in downstream plants completely outweighs by a factor of 3:1, the investment in the olefins complex. At a later stage, a separate pipeline for propylene, along with that for ethylene, can be installed.

We must strengthen our R & D base and come out with both improved as well as novel processes. There is a need to give special attention to the whole gamut of processes based on oxidation with oxygen. The future process design will have to be more accurate and scale-up procedures will have to be more reliable.

Petrochemicals — Emerging Technologies

Other Papers

The Inaugural session, addressed by Prof. Sharma was followed by the Technical Session - I for which the theme was ***'Petrochemical Technological Thrust/Developments'*** and was chaired by **Dr. M.H. Mehta** of GSFC. *'Advances in Caprolactum Technology'* by **G.G. Vaghela** (GSFC); *'Low volume high price speciality polymers/copolymers by suspension polymerisation'* by **S.V. Gogate,** (Polychem); *'Investment strategies in Petrochemicals'* by **J.K. Desai,** (Petrofils) and *'Contribution of Indian R & D in Petrochemical Technologies'* by **I.S. Bhardwaj** and **Ravindranath** were the papers presented in this session.

The Technical Session - II, with the theme ***'Technologies for Petrochemical building blocks', was chaired by*** **A.P. Chaudhary,** Gujarat Refinery. The papers presented in this session were *'Petrochemical building blocks — perspectives and technological approaches'* by **A. Kapadia,** (Hind. Oil Exploration Co.); *'Current and future feedstock scenario for petrochemicals'* by **G.R. Sampat** and **M.P. Gupta** (Gujarat Refinery); *'Technological status and emerging trend for natural gas as petrochemicals feedstock'* by **V.S. Pathak** (GAIL); *'Viable and emerging technologies for olefins'* by **Samarjit Das** (IPCL) and *'Aromatic technologies, state-of-the-art and advances'* by **M. Ganapati** (Reliance Industries).

The Technical Session - III was held on 22nd February and was chaired by **Dr. P.V. Krishna.** The theme for the session was ***'Technologies for petrochemical product manufacture'***. *'An overview of reactors in petrochemical industries'*, by **A. Dutta** and **G. Sambasivam,** (Tribune Projects); *'Catalysts — Key to petrochemical technologies'* by **T.S.R. Prasad Rao** and **G.N.Kulsreshta** (IIP); *'Petrochemical technologies for chemical products'* by **Y.L. Pandya** (Nirma); *'Synthetic rubbers in India'* by **M.M. Patel** (Apar Ltd.); *'Trends in polymer technologies'* by **P.V. Rao,** (Engineers India); *'Perspectives in synthetic fibre technology'* by **C. Bhattacharya** (Gujarat Refinery) and *'Polymer reclamation/recycle — A relief to environment'* by **P.R. Gharekhan** were the papers presented.

Technical Session - IV with the theme as ***'Technologies for product processing'*** was chaired by **M.J. Savla.** *'Processing technologies — machines and formulations'* by **S. Banerjee** (IPCL); *'Polyethylene compounds for gas pipelines'* by **C. Mahajan** (Interlink Services Pvt. Ltd.); *'Advances in fibre processing technologies'* by **V.K. Sharma** (Addi Industries); *'Technologies for filled polymers, alloys, blends and composites'* by **J.S. Anand** and **K. Ramamurthy** (CIPET) were the papers presented in this session.

The Seminar concluded with a lively panel discussion on the theme of the seminar. The discussion was moderated by **Y.L. Pandya** with participation by **Dr. M.H. Mehta, Dr. P.V. Krishna, M.J. Savla** and **J.K. Sharma.**

Mr. J.K. Sharma, the Seminar Organising Secretary and the entire organising committee deserve kudos for conducting this highly successful seminar on a very relevant subject.

Need to Regulate Chemical Consultants

N.S. VENKATARAMAN

Even though the Indian chemical project entrepreneurs appear to be running from pillar to post seeking new ideas and suggestions on chemical project opportunities and requiring technical knowhow for the chemical projects, there do not appear to be any dearth of chemical project consultants in the country. The tribe of chemical project consultants appear to be growing at rapid rate with new project consultants and consultancy set ups springing up almost every day in one part of the country or the other. It is often found that such consultancy set ups even do not have minimum facilities to operate satisfactorily, like well equipped office, trained staff and basic inhouse data base and technical literature. It may be shocking to note that quite a few of such consultants do not even have telephone facilities and they provide the address and telephone/fax numbers of the executive centres in the city for contact purposes and for conducting the meetings.

A number of consultants appear to be coming up due to various reasons and compulsions, which may include the following:

(1) The consultants in the plus 60 age group, who would have retired from services and who would like to keep themselves occupied, capitalising on the contacts already established during their service period.

(2) Persons who may have lost their jobs or may have entangled themselves in career problems in the vulnerable age group of late forties and early fifties, who need to eke out earnings for survival and who may not be able to find regular jobs "Commensurate with their status".

(3) Persons who are employed in government departments, public sector companies or private sector undertakings who would desire to make extra money by providing consultancy services during their spare time, keeping some other person or organisation in front of them to conceal their identity.

(4) Group of persons, who venture into consultancy field with the object of pooling their talent and meagre resources to become self employed.

It is generally seen that all the category of persons seek to get into consultancy profession, since starting of consultancy set ups would not require much investment. Several persons manage to get into this profession without any investment at all. Just as number of consultants keep on springing up in the country, a number of them also keep on fading away from the scene, unable to cope up with the "vagaries and demands of the market". In the process, due to the constant entry and exit of the chemical consultants from the scenario, the culture and image of the chemical consultancy scenario in the country itself remains uncertain, blurred and without prestige. It can be justifiably stated that one of the major problems faced by the Indian Chemical Industries is the inadequacy of reasonably competent project consultancy set ups in adequate number in the country. The poorly equipped chemical consultants in the country are often guilty of providing wrong leads to the chemical project entrepreneurs with regard to the market research findings, technology factors and identification of project opportunities for investment. This is so, since the consultants do not have adequate strength of information base and quite a number of them are themselves ill equipped, without long term plans and strategies. The chemical project entrepreneurs, who seek the services of such consultants, often do so, due to lack of choice as they have only to choose from the available consultants in the country. It is high time that firm steps should be initiated to bring the chemical consultants in the country under some sort of control, regulation and discipline, to prevent the impression spreading in the country that a number of chemical consultants operate like "Quake Doctors".

Though IDBI maintains panel of consultants, the financing institutions do not insist that only such IDBI listed consultants should be entertained by the Indian Chemical Industries. There are cases where even fresh engineers who may not find ready employment without any experience feel bold enough to offer chemical consultancy services. They take up responsibilities for designing the projects, as if this would be an academic exercise. Number of chemical consultants, who do not even have adequate laboratory facilities or even a test tube offer technical knowhow for the chemical projects, without any sort of fear or concern. It is very important that the consultancy profession in the country should not be allowed to remain as free for all, as a result of which it has already done significant harm to the Indian Chemical Industry. It is well known that a number of units mainly in the small and medium sectors, have become sick only due to technological reasons and such situation can be traced to the quality of technical knowhow provided to such chemical units. It is necessary that the technical knowhow for chemical projects should not any more be accepted by the entrepreneurs, without prior demonstration of the knowhow from the consultant. There cannot be any difference of opinion that strong, well equipped and committed consultancy organisations in the country is of vital importance, if the Indian Chemical Industries were to attain qualitative growth in the coming years. The sure way of strengthening the Indian Chemical Industry is to restrict the entry of every one into the consultancy profession, who may not have the minimum required facilities and organisational strength.

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New Frontiers in Food Additives — Fumaric Acid

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Fumaric acid is covered in prevention of Food Adulteration Rules 1955 under the clause of 48-C. It has been recommended as a food additive for human consumption, and is a legal acidulant in USA, widely used in wine, dried natural juice solids etc.

AS FOOD ADDITIVE FOR HUMAN CONSUMPTION

The major applications of fumaric acid are as under:

(1) Bread : it is incorporated into gluten protein during dough mixing of bread, which reduces the period of mixing and also amount of yeast to be used.

(2) Wine : Fumaric acid can delay the development of lactic acid bacteria and is particularly effective at low pH. Many times acidity is lost with development of odour and off-flavour, which is difficult to remove from wine. Incorporation of fumaric acid as acidulant improves the quality of wine.

(3) Garlic or Onion pills : Garlic is an important medicine for reduction Cholesterol in blood. The garlic pills are deodorised by addition of fumaric acid. Juice is squeezed from shredded garlic and its pH is adjusted to 3.2 by addition of Fumaric Acid. Monosodium glutamate is added and then subjected to two stage filtration. Nitrogen, and carbon dioxide are used as propellants.

(4) Meat : It improves shelf-life of meat.

(5) Hard Candy : A mixture of sweetening agents, water and fumaric acid and a second mass containing corn syrup, sucrose and water are cooked at 120°C to 170°C to get desired moisture level.

(6) Dehydrated peanuts, legumes ("matar") : Shelf life of these products is improved by spraying fumaric acid, while heating to 30-100°C so that the acid rapidly pentrates to the centre of the product. Fumaric acid 1.0 per cent weight is sufficient to improve the shelf-life.

The product is dried under vaccum. Fumaric acid not only improves shelf-life but also reduces undesirable aroma. (beany smell).

(7) Effervescent tablets : The digestive tablets comprised mixture of monoalkali salt of fumaric acid, carbonates and bicarbonates.

(8) Powdered soft drink and natural juice solids : It is incorporated in powdered soft drink as acidulant to improve shelf life.

(9) Anticlostradial agent : Fumaric acid exhibits potent anticlostridial activity. It is non-toxic and has far lower minimum effective concentration values as compared with sodium nitrite and ethylene dibromide.

Fumaric acid in animal feed

(10) Diet of broilers or laying hens : Egg quality of hens on diets mixed with 0.5 to 1.0% fumaric acid are found to have substantial improvement in quality. It is found that hens fed on 0.5% fumaric acid gave higher yolk index values and higher albumen index and those fed on 1% fumaric acid gave high reflectance values. When chicken are fed on diets containing 0.5% fumaric acid it is found that they increase their weight by 8 per cent.

(11) Diet of swine : It is being used for fattening swine. 0.75 per cent fumaric acid mixed in diet of swine for first 42 days was found to improve their slaughter yield, carcass length, backfat thickness, wt. of various organs and cuts, total fatty cut weight, total lean cut weight and lean cut to fatty cut ratio are studied. In short improved significant fattening of swine is observed.

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The ISO 9000 Series of Standards

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Two developments have taken place more or less simultaneously. The first is the economic unification of the European countries and therefore the formation of a very large cartel of buyers with similar policy towards import of goods and services into the hard currency area, ingress into which has been a cup-and-lip affair for the Indian supplier, except in small volumes, and in a disjointed way. That too is now difficult because of what will certainly amount to trade restrictions. Captive or regular importers in the UK and Western Europe have been informally apprising Indian exporters of the impending applications of the ISO 9000 series in the whole of the European Community for years and that, unless individual suppliers gear up and acquire the ISO 9001 (or 9002 or 9003) certification from an accredited certification body, they may have to stop importing from them. This restriction, we understand, will apply from the beginning of 1993. The rat-race, if one may so call it, is on.

The other good sign, which is in the process of shaping up, is the end of the Licence Raj in India or the gradual removal of restrictions. This may be due to the pressure applied by the IMF or World Bank as a corollary to our fast deteriorating foreign exchange situation, but certain economical reforms have made their appearance. Apart from the direct benefit to the entrepreneur (which has yet to make itself felt) there is an indirect advantage.

The senior management staff now has time and, if one may say, compulsion to look at an aspect which our industry has been lacking for ages. Traditionally, the Indian product has been labelled as something shabbily produced, badly packed, indifferently labelled or finished and poor in terms of design, performance, reliability or maintainability. With quality assuming the status of the 'buzzword' these lacunae are being given the once over by many forward looking companies and the scenario is changing fast.

Granted that, from the present reading of the situation, a large number of at least the "Export Oriented Companies" will have to go in for quality management systems duly supported by an accredited certificate to the ISO 9000 series, we have to understand clearly what is in store for us. On the one hand, a simplistic approach has been taken by some money-bags who are convinced that acquiring an ISO certificate is like purchasing a large car (the outlay appears comparable). On the other hand, a few (happily, not all) consultants have put the scare into the suppliers' minds that getting on ISO certification is like achieving salvation and that superhuman effort combined with concerted and continued 'Counselling' is required to make any headway. In this effort the services of the concerned consultant is offered, of course at a price that one can ill-afford.

The truth appears somewhere in between. It is true that top management determination is required in a large measure — in fact that has to be the guiding beacon and that all staff, especially the top and middle management level, has to be prepared for a psychological trauma which invariably accompanies a change from a closed society to an open system where everyone's actions are not only transparent but defendable. The effort, man-hours, expenses and the frustrations in the initial stages are all real and tangible, and it is not until one has reached around midway that the enthusiasm and excitement become palpable. From then onwards the momentum takes over and one overcomes the final difficulties and goes over the audit, leading to certification.

The ISO 9000 is only a method of making an organisation simpler, systematic and less expensive then hitherto. In practice, the code is a series of standards starting from 9000 which is actually a guide on which specification — 9001, 9002 or 9003 to choose for one's line of activity. Alternatively, one may opt for ISO 9004 which is applicable in a non-contractual situation: in a situation, so to speak, where one does not want to be "rewarded" with a certification but follow the code for self improvement alone. The series has been called a "commonsense" code.

In all my years of experience, I have never come across a code which is so replete with down-to-Earth approach, a phraseology which is compact, specific and yet so comprehensive, which is so supplier-friendly as the present set. The word "supplier" is interesting, as we in India tend to look down upon the supplier (or the contractor). We may like to call ourselves manufacturers, consultants, shippers or chandlers, designers, or whatever, but never a supplier, quite apart from the possibility of the term implying a procurer. But consider the difficulty that the Fathers of the code would have felt in searching for a word to describe an entity that provides good health, municipal service, education, product, aeroplane flights and so on. There is no word as expressive as 'supplier'.

(This article merely outlines the implication of the ISO 9000 series of standards as applicable to Indian conditions. It does not purport to be an authoritative explanation of the standards. The opinions expressed are the writer's personal views and not of the International Standards Organisation or Bureau Veritas Quality International (accredited Certification Body).

The ISO 9001 standard packs into a short length of five-and-a-half pages, a comprehensiveness and adaptability which has not been seen before. While covering every activity under the Sun, it is the only code that permits you to write your own policy, your own manual or top tier documentation as it is called, your own procedures and instructions and so on; no compulsions at all. There but is one lode star — Non conforming product or service shall not be rendered. Keep that in mind, and you are through. The flexibility of the specifications, some may choose to call them escape-routes or back door exits, is evident in the form of its, buts and howevers. Consider ISO 9001 (IS 14001) for example, which is the most comprehensive code of the series in the contractual situation. It is laced with phrases like:

"as appropriate" (or equivalent)	.... 8 times
"when specified in the contract"	.... 6 times
"Positive recall procedures"	.... 2 times

'Timely consideration', 'where practicable', 'where applicable', 'suitable action', 'to the extent necessary', 'alternatives when no such standards exist' or 'applicability when absence of such instructions would adversely affect quality' once each. The cleverness and, maybe, the ethics of the supplier determines how far he will utilise the above escape clauses; the vision and the strictness of the auditor and, above all, the requirements of the end-product or service will determine how far he will be allowed to get away with it; that is where the adequacy audit comes in.

What actually happens in this country is that the Quality Manual or the Apex Manual is written beautifully — an antiseptic paraphrase of the code requirements — clause by clause. It is when we come to the vertical and horizontal blending of the lower tier documentation and, evidently, the implementation on the office and shop floor that the lack of appreciation (or even understanding) of the requirements is revealed. We started with saying that the ISO 9K series is supplier-friendly. With thorough understanding and implementation in any industry or activity center, it can be a boon. It can save you enormous amounts of money and lots of aspirin tablets. Without that, the requirements on Document Control alone can cause you traumas beyond your ability to cope.

Happiness, says Parkinson, is seldom achieved by those who go in search of it. For most of us, happiness is a by-product, achieved when we are aiming at something else, for example when we are trying to market a good product at a fair price. When our organisation is efficient enough to do that, we shall find, perhaps to our astonishment, that we have achieved much more, including happiness. This applies as much to any systems as to Quality. The advantages of working to a system like the ISO are so marked that they themselves should ensure satisfaction and fulfillment. We, however, live in a world which demands evidence. An accredited certification provides such an evidence. A certification to the ISO 9000 series introduces to the whole affair a transparency and dependability besides improving the quality image, sets a bench mark and motivates exporters tc higher levels of business performance. Having said that, we would be well-advised to look upon a certification not as an end all. Rather, it is a reflection, a by-product or spin-off of adherence to Systematic Management.

Role of BVQI in certification

It has been stated earlier that the full value of certification can be derived only if it comes from an accredited certification body. The accreditation bodies are set up by the various governments like the NACCB (representing the DTI of UK), the RVC (Holland), AFAQ (France), RAB (USA), and so on. BVQI has been working with accreditation of the NACCB and RVC for a few years and has recently obtained accreditation of the Swiss government.

It is now in the process of acquiring the accreditation of the AFAQ, the RAB and the bodies under formation in Belgium, Germany, Sweden, Denmark, Italy, Australia, New Zealand. Basically, an accreditation is an expression of confidence by the respective government/body in the certification agency (like BVQI) that it is thorough, competent and independent. After the above recognition is granted, they are subject to surveillance audit regularly and to diverse controls like scope control and assessor control on an on-going basis. Starting its activities in 1988, BVQI has granted certification to 502 suppliers in 1991 (cc 170 in 1990) and is now represented in 24 countries outside UK: in India, we are authorized by BVQI to use an "all Indian crew" for assessment activities, thereby bringing down certification costs and the foreign exchange component.

Conclusion

What has the future in store? Gazing into the crystal glass one does not find a clear direction. Will the European Community carry out its 'threat' and treat as pariah all overseas suppliers who are not certificated? Will they make relaxation in specific cases? Only time can tell. Will there be some 20,000 certificated Companies in India at the turn of the century? Or, will the movement fizzle out after the 500 mark has been reached? One thing is for sure. The effort, time and money spent on setting up a Quality Management System cannot go waste. It will pay its own dividends by way of happier employees, more contented stakeholders and more peaceful management. Provided we do not treat it as a 'flavour of the month', provided we are clear about out objectives, provided we cast aside our mental block .....

(Paper presented at a seminar on 'Total Quality Management in manufacturing' organised by the Oil Technologists' Association of India (Western Zone) in Bombay on April 11, 1992).

The Basel Convention: A Breakthrough

GOH KIAM SENG*

SUMMARY

The world faces a hazardous waste crisis. In general countries do generate more industrial toxic by-products they are capable of treating or disposing of. Developing countries often lack the regulatory and technical sophistication to manage the wastes they produce in an environmentally sound manner.

It is essential and urgent to develop and share waste avoidance and cleaner technologies to reduce to a minimum the quantity and toxicity of wastes at the source.

The development of interanational public law regulating the generation, treatment, storage, transport, disposal, recovery, and after care of disposal operations is a first step in putting the hazardous waste crisis under control. And that is exactly what the Basel Convention on the control of Transboundary Movements of Hazardous Wastes and their Disposal is meant to achieve.

The main principles of the Basel Convention are:

a) The generation of hazardous wastes must be reduced to a minimum in terms of quantity as well as hazard potential at the source, (prevention principle).

b) Where the generation of hazardous wastes is unavoidable, they must be disposed of as close as possible to their source of generation (proximity principle). Moreover, the environmentally sound management of the wastes must be guaranteed, whatever the place of their disposal (non-discriminatory principle). Furthermore, each country should ensure the availability of adequate disposal facilities (adequacy principle).

c) Every country should aim at treating and disposing of the hazardous wastes they produce (self-sufficiency principle), and has the right to ban the importation of hazardous wastes into its territory (principle of national sovereignity).

d) The transboundary movements of hazardous wastes should be reduced to a minimum consistent with their environmentally sound management (ecological opportunity).

The rigorous control system (notification procedure, movement document, etc.) provided by the Basel Convention ensures that no hazardous wastes are being exported or imported, unless such movement is authorized under very strict circumstances (the transboundary movement becomes the exception).

INTRODUCTION

Hazardous waste has become an important environmental and human health problem in many areas of the world, and there is great concern for the future if it is not properly addressed. The rapid pace of industrialization will necessitate careful attention to hazardous wastes for decades to come. The growth of the chemical industry is a good indicator of this; every year 700 to 1000 new chemical compounds join the 90,000 already in commercial use, of which some 4000 account for 99.9% of the total production volume.

The problem has several dimensions. One of the most crucial aspects is the discovery and cleaning-up of abandonend hazardous waste dumps, many dating back decades. Another is the changing nature of the menace; with the development of new chemical products, new sources of wastes are created. Regulatory authorities must constantly update their legislation in order to control the spread of potentially dangerous wastes and their effects on the environment and human health. Another important aspect is the transboundary movement and disposal of hazardous wastes; their transfer to the developing world has received much attention. While some progress is being made with respect to all of these concerns, much remains to be done.

Wastes are heterogenous substance. They are a potential source of environmental pollution or a danger to human health. But wastes can also be integrated into the economic cycle when they are recovered, re-used or recycled. Then, they contribute, as resources do, to the conservation of energy and primary raw material.

The coming years will be characterized by the rapid growth and increasingly disparate nature of wastes arising from domestic, industrial or agricultural activities.

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal deals with hazardous wastes, their generation, storage, movements treatment, recovery and disposal.

The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal was

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adopted unanimously on 22 March 1989 by the 116 States participating in the Conference of Plenipotentiaries which was convened by UNEP's Executive Director and held in Basel at the invitation of the Government of Switzerland. The final Act of the Basel Conference was signed by 105 States and the Europe Economic Community.

Since the early 80's, both the United Nations and OECD were working on the elaboration of international regulations to control the movements of wastes. Already, in 1985, OECD convened the Basel Conference on International Co-operation concerning Transfrontier Movements of Hazardous Wastes. After the Seveso disaster, the European Economic Community took a number of legal measures to avoid further "wandering" of drums of toxic wastes.

Thirty-five States and EEC signed the Convention at Basel, and by the end of February 1991, 53 States have signed and 10 countries have ratified it. For entry into force the Convention needs a total of 20 ratifications or accessions.

Five main principles are governing the Basel Convention:

1. The quantity as well as the toxicity of hazardous wastes must be reduced to a minimum (prevention principle).
2. When hazardous wastes are produced, their management must be environmentally sound and they should be disposed of as close as possible to the place where they are generated (proximity and self-sufficiency principles). Transboundary movements must therefore constitute an exception.
3. In exceptional cases and until the appropriate technology and adequate infrastructure are available, and if adequate storage or treatment is impossible in the generating countries, it may be safer for human health and the environment to export hazardous wastes to a country capable of eliminating them in an environmentally sound manner (non-discriminatory and adequacy principles).
4. When a transboundary movement is authorized, it is subject to very stringent and regular control processes.
5. Increased international co-operation is necessary to assist developing countries to manage and treat the wastes they generate in an environmentally sound way.

(Refer to the Annex concerning the provisions of the Basel Convention).

Transboundary Movement

The majority of transboundary movements of hazardous wastes are justified by concern with finding the most economical treatment or disposal method. Some movements are conditioned by the need to ensure the environmentally sound disposal of wastes (ecological opportunities).

This indicates that countries produce more wastes than they can eliminate due to a lack of adequate installations, training capacity, financial resources or appropriate technology.

Other movements, which are illegal, are motivated by the possibility of important gains in transferring the problem to where controls or standards are less strict or because the vastness of the territory and the scant resources at the disposal of the importing country makes any attempt at serious surveillance impossible.

Faced with the increasingly higher costs of safely treating or disposing of wastes in countries where they are produced, many companies prefer to get rid of the problem at a lower cost by transporting them to another State (pollution transfer).

OECD estimates that in 1984, on average a consigmnent of hazardous wastes crosses an OECD frontier every 5 minutes all year round. There are more than 100,000 such movements in OECD European countries yearly. About 6,000 occur annually in North America. In 1989, approximately 250,000 tonnes of hazardous wastes crossed the Canada-US border. Many other movements take place in the world. For instance, Eastern European countries are importers of hazardous wastes from Western Europe.

1988 was the year when many illegal traffic incidents of toxic wastes to Africa were uncovered. This prompted strong reactions to stop such criminal acts.

Most of the legal traffic takes place among OECD Members countries, who are, at the same time, the major generators of hazardous wastes.

Over two million tonnes of hazárdous wastes are estimated to cross national frontiers of OECD European countries annually on the way to legal disposal either at sea or ashore. This figure represents 8 to 10% of all such wastes generated in these countries.

The quantity of wastes of all kinds is increasing. In 1990, OECD countries generated about 9 billion tonnes of wastes composed of 400 million tonnes of muncipal garbages, 1.5 billion tonnes of industrial wastes out of which some 300 million tonnes had hazardous characteristics, 7 billion tonnes of miscellaneous wastes (agriculture, mines, sewage, etc.).

A PLANETARY RESPONSE

Some General Aspects

A global strategy for managing hazardous wastes should include the following five criteria:

a) Security of people
b) Protection of the environment
c) Minimization of risks in the long term

d) Technical efficiency
e) Economic viability

UNEP belives that in the long run, the most effective way of protecting human health and the environment from hazards posed by toxic wastes is the minimizing of the overall generation of these wastes with an ultimate goal of reducing to the absolute minimum the movements of such wastes away from the country of origin.

In the near term, however, hazardous wastes should be disposed of, as far as possible, in their country of orgin, and transboundary movements of such wastes should be kept to a minimum and allowed only when it proves to be the only environmentally sound way of managing them at present.

The Role of the Basel Convention

In the initial phase, the Basel Convention will act to decelerate transboundary movements by imposing strict administrative control. This should not be met with major obstacles because it corresponds to the willingness of States to find solutions for controlling the movements of hazardous wastes world-wide. In the second phase, applying the provisions of the Convention should guide Parties to aim at self-sufficiency regarding the disposal of hazardous wastes. Here we are entering into a very complex process. For example, the EEC recommends such self-sufficiency at a level which does not necessarily imply self-sufficiency on the part of each member of the Community. In addition, technical co-operation should be the means by which all countries should ideally acquire the capacity and sophistication to treat their own wastes. This cannot come about without the provision of a massive amount of funds, transfer of appropriate technology and training of personnel. In the third phase, the Convention will address the question of reducing the quantity and toxicity of generation. Then, this becomes a societal problem. It involves mode of consumption and production. It involves also changing also changing the attitude and behaviour of people vis-a-vis nature, and a re-thinking of one's life-style.

More concretely, countries are gradually aiming at developing wastes management strategies which cover the process from generation to final disposal (and after care of disposal sites) including export, import, storage, transport and recovery. The principal preoccupations of States, knowing the dangers presented by hazardous wastes (on workplace hygiene, transport safety, damages that can come about to health and the environment), are increasingly being included in national policies.

It is an established fact that serious accidents can occur at any time without the countries involved having the necessary means for repairing these damages or acting quickly to avoid an escalation in the impact on the environment or health. The key word here is the capacity, in case of catastrophe, to act quickly and efficiently. It is, therefore crucial that the Basel Convention comes into force as soon as possible, so as to provide support to national efforts.

Furthermore, under the provisions of the Basel Convention, Contracting Parties can enter into bilateral or multilateral agreements on hazardous waste movements. Such agreements can provide for more stringent provisions than those of the Basel Convention, but they may not, under any circumstances, provide for less stringent provisions. Moreover, the possibility of entering into separate agreements provides a possibility for any group of countries with similar conditions and aims to adopt a common policy regarding movements of hazardous wastes.

HOW TO IMPLEMENT THE BASEL CONVENTION

Legal Framework

A first prerequisite concerns the elaboration of the appropriate national legislation to meet international obligations. There is a need for enacting regulations controlling the import and export of wastes subject to the Basel Convention as defined in its annexes.

In addition, illegal traffic should be subject to criminal domestic legislation. It is however, difficult in a number of cases to control "sham" recycling and mythic installation for recycling hazardous wastes. Storage is equality hard to control.

Environmentally Sound Management of Wastes

Basically, each Contracting Party to the Basel Convention should produce a national plan for the reduction and minimization of all risks of harm caused by hazardous wastes to health and the environment. This plan should include, **inter alia;**

— steps to reduce or avoid the generation of hazardous wastes;

— steps to optimize the environmentally sound recovery of hazardous wastes;

— steps to reduce to a minimum or eliminate the export of hazardous wastes. This entails the planning of environmentally sound disposal facilities, located as close as practicable to the source of generation, and the identification of the generators (production sites);

— identification of the type of wastes subject to the Basel Convention and the total annual volumes by type acceptable for import, **if any,** and the corresponding environmentally sound disposal facilities to be used.

— identification of all conditions required for granting of consent to exporters/importers desiring to move hazar-

dous waste through the territory of a transit country;

— identification of the adequate and most effective process by which to optimize the environmentally sound disposal of wastes;

— elaboration of contingency plans including risks analysis and emergency responses in case of accidents;

— steps required to rehabilitate polluted land filled areas or to redress ecological deterioration due to improper disposal of wastes (land-use plans and remedial actions);

— steps needed to comply with international transport regulations, standards or code of practice;

— steps to monitor pre- and post-disposal operations and effects (national surveillance programme);

— steps to develop liability and compensation measures for damages resulting from transboundary movements and/or disposal of hazardous wastes;

— timetable for implementation of the various and interrelated elements of a strategy for waste management.

Economic and Technical Aspects

Firstly, there is a need to evaluate the use of appropriate economic instruments which would help in reducing the generation of hazardous wastes and their transboundary movements (eg. incentives or disincentives, polluter pays principle, etc.).

Secondly, it is important to assess the economic impacts of prospective policies governing the management of hazardous wastes, including their transboundary movement.

Thirdly, there may be an opportnity to develop waste product exchange practicles at the domestic level.

On the technical side, the following main cosiderations should be highlighted;

— the role of technology in waste management including social and environmental assessment of the technology to be used;

— the current and potential role of the uses of wastes in substituting for primary raw materials and preserving energy and natural resources;

— the environmentally sound, economically viable and efficient practives of aiming at self-sufficiency in waste mangement disposal;

— the provision of technical assistance and training in the field of waste management and the transfer of environmentally safe technologies to help countries in need of such assistance.

Conclusion

Hazardous wastes are produced by all countries, irrespective of their state of developement. The risks to human health and the environment from the uncontrolled or bad disposal of hazardous wastes may be considerable.

Much intenational attention has recently been focused on the export of hazardous wastes from industrialized to developing countries. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, developed under the aegies of UNEP and adopted in March 1989 by 116 States, seeks to limit such exports to a minimum and to reduce the generation of wastes at the source.

Often, countries are ill-prepared to adopt solutions to the very complex and highly technical nature of hazardous wastes management. Lack of adequate knowledge, trained people and appropriate technology represent major obstacles to the institution of national strategies to dispose of wastes in an environmentally sound way.

Waste avoidance, and adequate recovery operations should be part of the requirements for an integrated "cradle to grave" approach. Governments need also to introduce proper legislation and control measures.

Furthermore, adopting hazardous waste management to the needs of developing countries is a must.

Once the Basel Convention becomes international law, it will contribute substantially to improving the situation world-wide by reducing transboundary movements and by promoting environmentally sound management of hazardous wastes.

The Basel Convention is the only international regulatory instrument dealing globally with this critical issue.

The Basel Convention should be perceived and analyzed in a dynamic, changing context. In order to achieve its objectives, a willingness to deal with problems in a spirit of solidarity is necessary.

The challenge is great. The sensitivity of people to environmental issues is making them speak up on their quality of life and thereby question those activities which downgrade or threaten it, This environmental consciousness brings with it, however, adverse effects which are difficult to neutralize. The search for aesthetics, quality of life and protection of the environment makes one unwilling to accept the wastes into one's backyard.

To this is added the fact that any regulation will bring about supplementary costs therefore making the wastes disposal process more costly.

The legal problems associated with damages resulting from transport or disposal of hazardous wastes are enumerous and complex, equally from the point of view of liability, financial coverage, determination of the cause as much as reconciling differences of opinion.

It is evident that neither regulation nor technology can, by themselves, provide all the answers to the challenge posed by the management of hazardous wastes world-wide. We are all as equally concerned with present day actions as with how we prepare for the future. It is by a combination of individual reponsibility and the institution of wastes management policies by States that mankind can truly contribute to solving the problem at the global level.

ANNEX

Summary of the Provisions of the Basel Convention

The generation of hazardous wastes as well as their transboundary movements shall be reduced to a minimum. The wastes should be disposed off as close as possible to their source of generation.

Every State has the sovereign right to ban the import of hazardous wastes. The Parties to the Convention shall not allow any transboundary movement of hazardous wastes to State that has prohibited their import. Transboundary movements shall also be prohibited if the exporting State has reason to believe that the wastes in questions shall not be managed in an environmentally sound manner.

A Party shall not permit hazardous wastes to be exported to a non-Party, unless it is in accordance with bilateral, multilateral or regional agreement, the provisions of which are no less environmentally sound than those of the Basel Convention.

The State of export shall not allow a transboundary movement of hazardous wastes to commence until it has received the written consent, based on prior detailed information of the State of import, as well as of any State of transit that has not informed the Convention Secretariat of its decision to required no prior written consent for transboundary movements of hazardous wastes.

When a transboundary movement of hazardous wastes which is carried out in accordance with the Convention cannot be completed in an environmentally sound manner, the State of export has the duty to ensure the re-importation of the wastes within a time limit.

Transboundary movement of hazardous wastes which do not conform to the provisions of the Convention are deemed to be illegal traffic.

The Convention states that "illegal traffic in hazardous wastes is criminal". The State responsible for an illegal movement of hazardous wastes has the obligation to ensure their environmentally sound disposal, by re-importing the waste or otherwise. Every Party shall introduce national legislation to prevent and punish illegal traffic in hazardous wastes.

— The wastes covered by the Convention are defined in its annexes. Hazardous wastes subjects to transboundary movement must be packaged, labelled and transported in conformity with generally recognized international rules and standards. The Convention calls for international co-operation involving, among other things, the training of technicians, the exchange of information, and the transfer of technology.

— The Convention calls for international co-operation between Parties in areas related to environmentally sound management such as development of waste avoidance technologies, transfer of technologies and know-how, training, harmonization of technical standards and guidelines, monitoring of the effects of waste management on human health and the environment.

— The Convention provides for the establishment of a Secretariat, the main functions of which shall be to process and disseminate information provided to it by the parties, to ensure co-operation between Parties, and to provide assistance to them in implementing the Convention.

— The Convention provides that UNEP will carry out the Secretariat functions on an interim basis, pending the first meeting of the Conference of the Parties to the Convention after its entry into force.

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(Paper presented at the 'HAZPAC-91' held in Cairns, Australia in April 1991)

Hazardous Waste Management in Thailand

PORNCHAI TARANATHAM*

The problems of waste generation and management though not unique to India, differ from those in other countries, particularly in the developed world, in-so-far as the source of pollution goes. The wide dispersal of industries in India, and it's size, although having socio-economic and other benefits, has led to a peculiar situation calling for imaginative solutions to the problems of pollution and hazardous waste management.

As this paper tells us, countries such as Thailand, have similar problems. Their efforts in tackling them have through familiar programmes including common effluent treatment plants, etc., and effective legislation form the basis of this article presented at the 'HAZPAC-91', held in Cairns, Australia in April 1991.

STATUS OF HAZARDOUS WASTE MANAGEMENT IN THAILAND

During the last several years, rapid economic growth and industrialization have created and accumulated major toxic and hazardous substance pollution problem. The presence of relatively high concentration of heavy metal in the rivers or the accumulated volume of hazardous waste in various sources are indication of hazardous waste increasingly released to environment. These problems are now becoming environmental issues of great concern for the Royal Thai Government (RTG) and in position of attempts to improve the situations by introducing the proper management system.

In Thailand, there are many different types of hazardous waste generated from various sources throughout the spectrum of industrial sector, hospitals and laboratories, public utilities, marine activities, communities, agriculture activities. It was estimated that about 1.9 million tonnes of hazardous waste were generated in 1991. These amounts are expected to be 3 times in the year 2001. Heavy metal sludge and solid are the main types of hazardous waste. Other 13 types are listed as shown in Table 1.

Situation of Hazardous Waste Management in each significant sources are summarized as follows:

Hazardous Waste from Manufacturing Industries and Mineral Resource Industries

The major source of hazardous waste released to environment are industries. The proportion of industrial hazardous waste is about 87% of total hazardous waste. In 1988 Thailand had approximately 100,000 factories registered with the Ministry of Industry (MOI). This number is still increasingly in trend. The size varies considerably from in house activities up to large scale factories. Most of them are in the range of small and medium size. All of industries in Thailand have been identified into 99 types, of which 52 types (about 27,000 factories) are identified as generator of hazardous waste. Bangkok Metroplis (the capital city of Thailand) and other surrounding provinces is the great industrial area. Example of industries generated hazardous waste are electroplating, paint, chemicals, textile, dry cell battery industry etc. Mineral resource industries (including mining, ore dressing

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Table - 1
PROJECTED HAZARDOUS WASTE QUANTITIES BY WASTE TYPE

Waste type	Hazardous Waste Quantities Thousand Tonnes/year			
	1986	1991	1996	2001
Oils	124.19	219.47	387.89	686.36
Liquid Organic residues	0.19	0.31	0.52	0.88
Organic sludges & solids	3.74	6.67	11.95	21.53
Inorganic sludges & solids	11.70	19.25	32.04	54.08
Heavy metal sludges & solids	823.87	1,447.59	2,536.03	4,418.03
Solvents	19.78	36.16	66.53	124.31
Acid wastes	81.05	125.43	196.51	311.71
Alkaline wastes	21.95	34.24	54.02	86.20
Off spec. products	0.01	0.03	0.05	0.11
PCB	2.46	**	**	**
Aqueous organic residues	0.12	0.24	0.50	1.04
Photo wastes	8.82	16.35	30.40	57.81
Municipal wastes	7.23	11.79	19.09	31.09
Infectious wastes	46.67	76.08	123.22	200.70
Total	1,151.73	1,993.60	3,458.76	5,993.84

**Total existing quantity estimated at 2,468 tonnes. It has been assumed that no new PCB containing materials were imported to Thailand after the mid 1970's.

and smelting operator) are other significant generators. In Thailand there are about 15 types of mining activities having a significant potential for generation of hazardous waste e.g. lead, lignite, manganese, tin, wolfram, zinc, etc. There are approximately 290 plants of ore dressing facilities distributed in the country. Most of them are tin ore processing facilities. The annual volumes of heavy metal containing slag, sludge and dust generated from smelting operation in 1991 is about 1.3 million tonnes.

In general, treatment and disposal of industrial hazardous waste is responsibility of each industry under control of MOI. The large industries treat their waste by their treatment facilities approved by MOI and dispose by landfill or open dump in their own lands. However there are many small and medium industries which have no treatment plant and discharged their waste without any treatment.

Recently, a number of projects for handling industrial waste by establishing central or joint waste treatment centres and secured landfills have been established by MOI. The construction of first treatment centre was already built in the western suburb of Bangkok and has been operated to treat wastewater from electroplating and dyeing textile factories, with capacity of 200 and 800 cubic metres per day respectively and 100 tonnes per day of other hazardous sludges or solid waste. Hazardous landfill site (about 160 ha) was recommend to be implemented in Rachaburi province (about 100 kms from Bangkok). The acquisition of a disposal site is under way and a public hearing with local villagers has been held. This project is a solution for the small and medium factories to minimize the treatment cost. The construction of all necessary facilities was invested by government, however the operation is handled by a private contractor. MOI will further develop similar central treatment plants in other areas.

Infectious waste from hospitals, health centres and clinics

Approximately 4% of hazardous waste in Thailand are infectious wastes generated from hospitals, health centres and clinics. Although the amount of infectious waste is relatively small, it is quite difficult to segregate these wastes to avoid contamination of non-infectious waste. In 1991 it is found that only 21 hospitals have their own incinerators. The rest of them (about 1,100 hospitals) have no treatment system. They manage their waste in the same manner as community waste. Bangkok Metropolitan Administration (BMA), one of the responsible agencies in this area is presently planning to construct a facility to burn infectious waste from hospitals, health centers and clinics in Bangkok Metropolis.

Hazardous waste from public utilities

The major existing hazardous waste from public utilities is PCB contaminated equipment from electric utility industries e.g. the Electricity Generating Authority of Thailand (EGAT), the Metropolitan Electricity Authority (MEA), and the Provincial Electricity Authority (PEA). An approximate estimate of total quantities of PCB contaminated material from existing electric power generation is about 2,468 tonnes from transformers and capacitors. These PCB wastes are currently stored in the open and in some cases stored in steel containers awaiting development of appropriate disposal method.

Oily waste from marine activities

Quantity of oily waste expected at major ports and harbours in Thailand have been estimated at about 75,850 tonnes or about 3.7% of total hazardous waste based on the assumption that oily waste production is proportional to shipping tonnage. The principal government organization having operational responsibilities related to oily waste generated from marine activity is the Harbour Department. They have a number of oily waste needed to be disposed at many ports. While the Port Authority of Thailand has incharged incident of illegal shipment of hazardous waste in to Thailand to non-existant consignees occurred in the past.

Municipal solid wastes

For all of community waste, which undoubtedly includes quantities of hazardous waste from household, hospital or industries, since there is at present no provision for separation of hazardous material from other wastes, therefore it is probable hazardous material are being disposed in open dumping at landfill site.

Hazardous waste from agriculture activities

From statistics provided by the Ministry of Agriculture and Cooperatives (MOA) the import and consumption quantity of pesticide in Thailand is about 29,300 tonnes in 1986. Approximately 62% of the pesticides utilized are currently formulated in production facilities in the country and the rest of national requirement is imported in ready for use form. Handling of agricultural hazardous waste is under control of MOA.

LEGISLATION AND INSTITUTIONAL ARRANGEMENT

Legislation

Hazardous waste control in Thailand is now based on the separate pieces of legislation under a variety of agencies which have either partial or implied responsibilities. A brief summary of the important legislation concerning this matter are as follows:

(1) Poisonous Substances Act, 1967 and amended in 1973: This act was enacted to control the import, export, manufacture, storage, transport, usage and disposal of toxic substances and their containers. Under this act, toxic substance used in agriculture, industry and public health are under the joint control of three ministries namely, the Ministry of Agriculture and Coperatives (MOA), Ministry of Industry (MOI) and Ministry of Public Health (MOPH). The three ministries are also empowered to issue ministerial regulations or notifications under this act. According to the latest notification, chemical wasted as defined in the attachement of the Basel Convention was listed as toxic substances. By this notification, the import, export, transportation and utilization of these substances will be automatically controlled.

(2) Factories Act, 1969: This act empowers the Ministry of Industry to control the establishment and operation of factories. Under this Act, MOI has recently promulgated new regulations establishing a definition of what should be considered hazardous waste and required to handle with specified method as afore mentioned.

(3) National Environmental Quality Promotion and Conservation Act (1975 amended 1978): This act created the National Environment Board (NEB) and the Office of the National Environment Board (ONEB). It authorizes NEB to perform functions which are mostly concerned with policy development and coordination with other government agencies in matters relating to environmental quality. With respect to hazardous waste management, the NEB has formed a number of committees to establish policy and measures for handling and control of hazardous waste.

The 1978 amendment empowers NEB to issue ministerial regulations in designated projects that are required to submit and Environmental Impact Assessment (EIA) to ONEB for prior approval. Presently, ten types of projects are required to submit EIA.

(4) Public Health Act: This act was enacted to regulate activities affecting public health and welfare. It briefly states that local authorities have full responsibility to develop ordnances and regulate solid waste and infectious management, maintenance of public lavatories, nuisance abatement, food sanitation and others.

(5) Other Acts: Other Acts related to toxic and hazardous wastes management are Land Transportation Act and Navigation in Thai Waters Act (1913) which govern the control of transportation of hazardous substances. Regulation of the Office of the Prime Minister on Accident Prevention (1983) created National Safety Council of Thailand (NSCT) to advise the Cabinet in matters related to accident prevention. Minerals Act (1967) empowers the Department of Mineral Resources, under MOI to control the license of those involved in mineral resource industries and prohibit the discharge of toxic substance to environment. Atomic Energy and Peace Act (1961) empowers the Office of Atomic Energy for Peace (OAEP) to regulate and enforce the use of nuclear energy including importation, transportation and disposal of radioactive waste.

Institutional Arrangement

The principle Governmental agencies having operational responsibilities related to hazardous waste are the Ministry of Industry, Ministry of Public Health and Ministry of Agriculture and Cooperatives. Their responsibilities are related to industrial operation, domestic activities and agricultural practices respectively. The Office of the National Environment Board (ONEB) has responsibilities for environmental policy development and also coordinating various Royal Thai Government Agencies (RTG). A summary of the existing laws and agencies with activities involved in hazardous waste is shown in Figure-1.

POLICIES AND STRATEGIES FOR HAZARDOUS WASTE MANAGEMENT IN THAILAND

In recent years the requirement for policy and plan with regard to hazardous waste management has been recognized by the RTG as a critical need for future development activities which could be properly implemented by the related agencies. Hence in the Seventh National Economic and Social Development Plan (1992-1996), RTG has drawn up the policy and plan of hazardous waste management which will be used as a guideline by the implementing agencies.

The Major Components of the National Policy are as follows:

(1) Since hazardous waste problem can cause damage to public health and environmental quality, it should be considered as a serious problem that state and generators must share the responsibility in handling.

(2) Systematic hazardous waste management should be urgently implemented in order to increase the efficiency of collection, transportation, treatment and disposal of waste, particularly on industrial hazardous waste and infectious waste.

(3) The Polluter Pays Principle (PPT) which charges generators or whoever gets benefit from hazardous waste should be applied in the implementation. Moreover imposing effluent tax and creating environmental fund strategy should be earmarked for the construction and operation of hazardous waste treatment facilities.

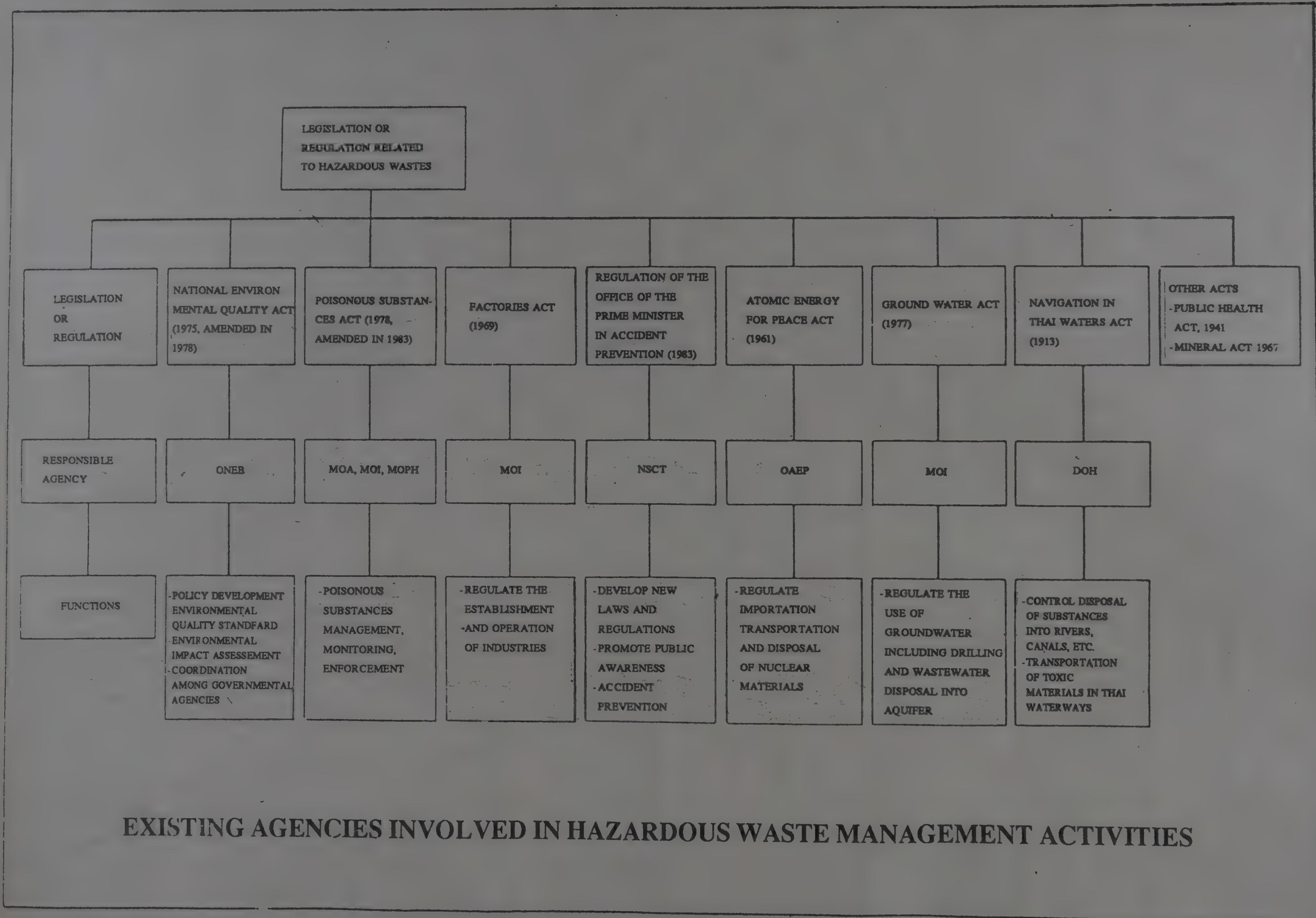
LEGISLATION OR REGULATION RELATED TO HAZARDOUS WASTES
LEGISLATION OR REGULATION
NATIONAL ENVIRON MENTAL QUALITY ACT (1975, AMENDED IN 1978)
POISONOUS SUBSTANCES ACT (1978, AMENDED IN 1983)
FACTORIES ACT (1969)
REGULATION OF THE OFFICE OF THE PRIME MINISTER IN ACCIDENT PREVENTION (1983)
ATOMIC ENERGY FOR PEACE ACT (1961)
GROUND WATER ACT (1977)
NAVIGATION IN THAI WATERS ACT (1913)
OTHER ACTS -PUBLIC HEALTH ACT, 1941 -MINERAL ACT 1967
RESPONSIBLE AGENCY
ONEB
MOA, MOI, MOPH
MOI
NSCT
OAEP
MOI
DOH
FUNCTIONS
-POLICY DEVELOPMENT ENVIRONMENTAL QUALITY STANDFARD -ENVIRONMENTAL IMPACT ASSESSEMENT -COORDINATION AMONG GOVERNMENTAL AGENCIES
-POISONOUS SUBSTANCES MANAGEMENT, MONITORING, ENFORCEMENT
-REGULATE THE ESTABLISHMENT -AND OPERATION OF INDUSTRIES
-DEVELOP NEW LAWS AND REGULATIONS -PROMOTE PUBLIC AWARENESS -ACCIDENT PREVENTION
-REGULATE IMPORTATION TRANSPORTATION AND DISPOSAL OF NUCLEAR MATERIALS
-REGULATE THE USE OF GROUNDWATER INCLUDING DRILLING AND WASTEWATER DISPOSAL INTO AQUIFER
-CONTROL DISPOSAL OF SUBSTANCES INTO RIVERS, CANALS, ETC. -TRANSPORTATION OF TOXIC MATERIALS IN THAI WATERWAYS
EXISTING AGENCIES INVOLVED IN HAZARDOUS WASTE MANAGEMENT ACTIVITIES

Figure - 1

(4) Waste minimization and waste utilization should be promoted in order to reduce waste at the source of generation.

(5) In keeping with rapid expansion of industrialization and socio economic development, participation of the public and various private organizations in efforts to investigate or handle the problem should be encouraged.

(6) Specific laws or regulations will be enacted in particular on hazardous waste issues when it is necessary to amend relevant legal provision in various acts or when there is no definite enforcement.

(7) Development of fundamental support system such as organization, manpower, financial arrangement, monitoring system etc. are essential part of strategy for hazardous waste management.

THE NATIONAL HAZARDOUS WASTE MANAGEMENT PLAN FOR THAILAND (NHWMP)

In 1989, Office of the National Environment Board (ONEB) prepared a National Hazardous Waste Management Plan for Thailand (NHWMP) under grant aid from U.S. Trade and Development Programme (U.S. TDP). NHWMP is in accordance with national inventory of hazardous waste as well as short-term and long-term measures for hazardous waste management. At present, major recommendations are in the process of preparation of action programme for related agencies to be impemented in the next 5 years (1992-1996).

The major components of NHWMP cover the following areas:

(1) Hazardous Waste Definition: Because of the necessity for hazardous waste definition which should be used as a preliminary basis for developing the hazardous waste mangement programme, it is recommended to define what is meant by hazardous waste and their characteristic in the proper legislation.

(2) Segregation of Hazardous Waste: Guidelines or standard for segregation or storage of hazardous waste from various sources should be established. Short term or long term storage facilities are essential before transfer to final disposal facility.

(3) Manifest System: The implementation of manifest system is important measure in order to ensure that hazardous waste are properly handled and go to the appropriate facilities. In addition, Thailand should consider the Basel Convention as a means of controlling illegal shipments of hazardous waste to Bangkok and other port facilities.

(4) Waste Minimization: Reduction of waste at the source and waste utilization will be encouraged by various measures i.e. supporting waste exchange service, providing facilities for collection of recyclable waste, imposing tax on disposal, providing financial incentive and establishing information and awareness programmes.

(5) Development of Hazardous Waste Treatment and Disposal Facilities: For more effective treatment of hazardous waste, four hazardous waste treatment centres are planned to be additionally constructed in eastern and northern suburbs of Bangkok as well as in Ratchaburi province and in Rayong province in the Eastern Seaboard Development Area. These centres will consist of physical-chemical treatment facilities, distillation plant, incineration plant and secured landfill for handling liquid, sludge and solid hazardous waste from all industries which are situated in the high density waste sources.

In addition an incineration plant for disposal of infectious waste generated from hosphitals in Bangkok Metropolis is also planned to be constructed at On-nooth dumping site. The feasibility study is being prepared by the government budget.

(6) Spill Response Capability: The important activities under this NHWMP include a fundamental emergency response plan using the hazardous waste system information currently available and providing equipment and train at least one response team for the Bangkok Metropolis.

(7) PCB Waste Disposal: The immediate activities to deal effectively with the problem of PCB's waste stock are the development of the appropriate storage facilities, the inventory and record of the quantities and location of electrical equipment known or suspected to contain PCB as well as training of electrical utility workers who service or repair equipment.

(8) Data-Base Management: Improvement in the completeness and accuracy of data base is necessary to insure that all wastes are accounted for in both planning and control of hazardous waste management.

(9) Contamination of Heavy Metal from Mineral Resource Industries: Consequent to a serious arsenic contamination problem in Ronphibol district of Nakorsrithammarat province, continuation of current efforts to provide safe water supplies and minimise future arsenic contamination problem in that area should be pursued for the short action programme. Long-term activities should focus on identification and corrective actions for other as-yet-undiscovered areas where similar conditions may exist.

(10) Promotion of Privatization on Hazardous Waste: Specific actions aimed at privatization on hazardous waste

management will be taken by RTG to prepare projects which would attract private sector interest and establishment of a package of incentives for private participation including guarantee, tax benefit, various regulatory exemption and other privileges.

(11) New Legislation: New laws or regulations will be enacted on particular hazard waste issues when it is necessary to amend relevant legal provisions in various act or when there is no definite enforcement.

(12) Training Needs and Public Awareness: It is recommended to organize the traning programme for persons in charge of collection, transportation, treatment and disposal of hazardous waste. Education and public campaigns will also be accelerated to raise public awareness and promote an understanding of hazardous problem and the damage that they may cause.

(13) Programme Monitoring: Monitoring the activities o hazardous waste generators, transporters and disposal facil ity will be implemented. It can be accomplished through bot regular and random spot check by the responsible agencies

Although NHWMP has already been made, RTG recog nizes that much work remains to be accomplished to improv our management systems. These tasks are not only requir interministerial co-operation or government budget, but als require public awareness along with the public understand ing of its role in hazardous waste management. Privatization schemes, research and development for waste reduction, util ization, treatment and disposal technologies as well as impos ing suitable legislation against the polluters must also b emphasized. It is hope that NHWMP will lead toward a nev era and will be accomplished at an early date. Then th national environment and resource can be maintained in goo condition for the beneficial usage of our future generations

News from Abroad

SHELL GROUP ANNOUNCES SURPRISINGLY GOOD RESULTS

Shell group, the Anglo-Dutch oil company has announced surprisingly strong first-quarter results. Increased earnings from exploration and production helped the company to increase net income on a historical cost basis to sterling 858m ($1.52 bn), up just over 1 per cent from sterling 847m in the same period last year.

With the price of Brent crude around $3 a barrel lower than in the first quarter of 1991, analysts had forecast figures of between sterling 450m and sterling 650m. Current cost net income, which includes stock gains or losses, fell 22 per cent to sterling 854m from sterling 1.23 bn. The figures reflected a strong performance in upstream and downstream business outside North America.

Shell said margins in its Asian market remained relatively firm becuase of lower levels of export from the Middle East and growth in demand. **Mr. Fergus MacLeod,** oil analyst at County NatWest in Edinburgh, said: "These are very intriguing figures and completely at variance with anything any other company has managed to deliver. They reflect a great deal of success in holding on to margins at the pumps and refineries".

Shell's oil production in the first quarter rose 6 per cent to 2.22 million barrels a day. Gas sales volume also rose 9 per cent to 8.31 bn cu ft., a day. Earnings in the exploration and production sector rose to sterling 468m from sterling 443m last year with higher production and specific items including a US contract settlement and tax adjustment more than offsetting the lower oil price.

Downstream manufacturing and marketing earnings increased to sterling 298m compared with sterling 254m, although they fell on current cost basis to sterling 300m from sterling 624m because of lower margins. Gains from corporate items also boosted the figures.

RUSSIA ENDS CONTROLS ON OIL, GAS PRICES

Russia has liberalised internal oil and gas prices as part of a long-promised market reform. The government will continue controlling prices for oil and gas sold to Russian enterprises — but at six times higher than the present artificially low Rs. 350 a tonne.

The system, expected to be put in place soon will be enforced by fining suppliers who exceed new ceilings for energy prices. The resolution, signed by President Boris Yeltsin, also says former Soviet republics which do not have special arrangements for oil sales in bilateral agreements with Russia will have to pay prices based on "world levels".

Dismantling state controls on energy prices is a key component of the radical economic reform programme which Moscow has agreed with the International Monetary Fund. The measures aim to stabilise energy prices but they will inflict unpredictable hardships on inefficient enterprises, and will throw into disrray the economies of other republics which do not have their own energy supplies, or which, in the case of the Baltics, have no special deal with Russia.

The new ceiling for oil prices charged to Russian enterprises will be between Rs. 1,800 (after which suppliers will be taxed up 90 per cent) and Rs. 2,200 (after which increases are a punishable offence). But these are still considerably below the world market price.

VENEZUELA INVESTS $3.8 BN IN OIL REFINERIES

Venezuelas's national oil company, PDVSA, is investing more than US $3.8 bn to upgrade its two largest oil refineries. The investments are among the largest in the world oil refining industry. The company has placed a high priority on the investment and they are not likely to be affected by budget cuts — anticipated this year because of lower-than-expected world oil prices.

Upgradings are planned for the Cardon refinery, operated by PDVSA subsidiary Maraven, and at the Amuay refinery, operated by Lagoven, another PDVSA division. The investments are intended to enhance product quality to meet future environmental standards (especially those of the Clean Air Act in the US). They are also designed to increase processing of heavy crude oils and to raise profitability.

The two refineries, connected by a system of pipelines last year, have combined crude oil processing capacity of 935,000 barrels per day. Viewed as a single complex, that makes Amuay and Cardon the largest complex in the World.

Cardon, with 300,000 b/d of processing capacity, is receiving investments of $3 bn. Outlays for a delayed coker, catalytic platformer, isomerisation unit, and other projects will radically alter the refinery's product slate.

The facility now produces about 70 per cent distillates and 30 per cent high sulphur fuel oil. By 1994, the refinery is expected to produce 90-95 per cent distillates and only 5-10 per cent fuel oil. Investments at Amuay, which has a capacity of 635,000 b/d, will total $818 m.

Budget to be cut by $1 bn

The state oil company Petroleos de Venezuela S.A. (PDVSA) will reduce its 1992 budget by more than $1 billion, with the areas to be cut still uncertain, company officials confirmed recently. The budget cuts, the result of lower world oil prices were decided in meet-

ings between PDVSA president Gustavo Roosen and the Minister of Finance, Planning and Energy and Mines. Following a cabinet meeting Roosen estimated the cuts at approximately 70 billion Venezulean bolivars, but said the specific cuts were not yet finalised. Roosen indicated the move could affect plans to increase heavy crude refining capacity at Venezuela's Amuay Bay and Cardon refineries.

GLITSCH FORMS TECHNOLOGY COMPANY

Glitsch, a designer and supplier of mass transfer systems and technology, recently announced the formation of Glistch Technology Corporation (GTC). GTC will focus the wide-ranging capabilities of the Glitsch companies on the development of advanced chemical separations technologies, along with related engineering services. GTC will also be engaged in process development at its research facilities in Houston, Texas and in collaboration with Montana State University in Bozeman, Montana.

Joseph Gentry, GTC's Operations Director, said that the company's initial efforts will focus on extractive distillation, with emphasis on the development and marketing of methods for difficult separation applications. GTC's work in extractive distillation will be further supported by the company's alliance with Extrax Inc., of Redmond, Washington, which has allowed GTC to acquire the rights to more than 100 patents in extractive distillation developed by noted researcher, Dr. Lloyd Berg.

These patents cover a wide range of separations such as alcohols, organic acids, chlorinated solvents, aromatics and others. In its 79 years, Glitsch has completed more than 32,000 mass transfer projects in the refining, petrochemical, gas processing, pharmaceuticals and chemical processing industries.

EC CARBON TAX MAY RUN INTO POLITICAL SANDS

The EC's proposal on the introduction of an energy and carbon tax could run into the sands because it is conditional on the US and Japan adopting similar measures.

The Bush Administration is considered most unlikely to adopt a carbon tax. Aside from the fact that Mr. Bush is fighting an election this year, his administration has staunchly resisted pressures for a fiscal solution to energy and environmental problems.

The US aversion to deadlines on emissions controls was highlighgted by Mr. Bush's earlier wavering on whether to attend the Rio Earth Summit. He made his attendance conditional on a redraft of the treaty on climate change to exclude specific deadline for emission controls. The US is the only major industrial nation which has not adopted the year 2000 deadline to reduce emissions to 1990 levels.

Instead of taxes, the US strategy is based on a range of specific measures, such as tightening efficiency standards for equipment, and promoting energy efficiency audits. The question, however, is whether the US can make progress on these fronts without an energy tax. Recently the Washington-based Institute for International Economics concluded taxation should form a key part of any strategy to combat global warming.

The Japanese government, keen to take a high political profile on environmental issues, was caught out of step by the Commission's approval of such a tax. Debate is continuing within Japanese Ministries over an energy tax, but two of the more powerful, the Ministry of International Trade and Industry (MITI) and the Ministry of Transport, have generally opposed a tax that would increase fuel costs for industry.

Their concerns were reflected in Japanese delegates' insistence that the Tokyo Declaration, issued in April at a UN-sponsored eminent person's meeting on the environment, contain only an ambiguous reference to energy taxes and emphasise the importance of economic growth.

German Minister criticises stand

German Environment Minister Klaus Toepfer recently attacked the European Commission for proposing to wait with an EC Carbon Energy Tax until Washington and Tokyo adopt similar levies to protect the earth's climate. Toepfer said he would seek support from other European Community Environment Ministers to go ahead with an EC tax without waiting for other countries.

Toepfer sees the EC Commission decision as a step back from the Community's previous policy on protecting the atmosphere'', a statement from his Ministry said. ''This brings the danger of the Community losing its credibility and the clear leading role it has played so far just before the talks in Rio'', Toepfer said, referring to a United Nations Earth Summit in Brazil next month.

The Commission agreed earlier to propose an EC wide Carbon Energy Tax of $10 per barrel to help reduce emission of carbon dioxide, a chief gas blamed for the so-called Greenhouse Effect heating up the planet. But the legislation, which has to be agreed the by 12 EC Governments, would take effect only if other leading industrialised countries followed suit. The United States has firmly resisted any limits on carbon dioxide emissions. A barrel of brent blend crude oil, a benchmark, costs just under $20 at present. However, the proposed tax is bitterly opposed by oil producing countries and it is highly unlikely that EC Ministers will be able to approve it by the end of the year. EC wide tax initiatives require unanimous approval by the 12 Governments.

"The entry into force (of the tax) will be conditional on the adoption of similar measures on the part of other OECD Organisation for Economic Cooperation and Development Countries", "Environment Commissioner Carlo Ripa di Meana said.

Noting that President Bush had dropped his original opposition to the idea of stabilising "Greenhouse Effect" emissions by agreeing to a draft U.N. treaty on curbing global warming recently. Ripa said he was optimistic the U.S. administration would eventually come round to supporting energy taxes too.

"My impression is that a firm and clear-cut-EC position will perhaps not in the short term but in the medium term result in a basic change of the negative U.S. stance at the Earth Summit in Rio de Janeiro next month and over subsequent months.

"There will be every possibility to reexamine elements later on but if we took a different approach today it would weaken the pressure", Ripa said.

He called the Commission's proposal revolutionary, saying it was the first time the free market instrument of taxation had been harnessed so extensively to back environmental protection. It is also the first major EC wide tax the Commission propoosed.

The tax is by far the most controversial component in a package of energy-saving measures proposed by the Commission to enable the EC to reach its target of capping emission of carbon dioxide (CO_2) at 1990 levles by the year 2000.

But some officials, wonder if it will be enough to achieve the 12 per cent cut in CO_2 emissions needed to stabilise them. The non-tax measures aim to stimulate wider use of renewable energies and encourage greater energy conservation. Providing ministers broadly endorsed it at meetings over the next two weeks, the package should put the Community in a strong position to take a leadership role at the Rio Summit formally known as that UN Conference on Environment and Development.

Earlier European Commission raised the stakes in the fight agained global warming on conditionally agreeing to propose a controversial Energy Tax within the 12-nation European Community.

The proposal, certain to face opposition from some EC Governments, effectively ruled out introduction of the tax for the foreseeable future because President George Bush has refused to consider raising the United States's low energy prices.

BIOLOGICAL DIVERSITY BEING THREATENED

Biological diversity on Earth is increasingly threatened by industrialisation, growing pollution of the air and seas, overfelling of tropical rain forests and mass tourism.

Every day, at least 50 species of plants and animals become extent worldwide, the United Nations Environment Programme says.

The Earth is estimated to hold about 10 million species. One tenth of them would be lost in 10 years if the current trend continues. Among the endangered species are the edelweiss flower and the Black Salamander in the European Alps, Marmots and Apollo Butterflies.

The number of species endangered in rain forests is unknown. A convention to protect rain forests could help to save all species there that is between 50 and 90 per cent of world species.

A climate convention that would halt carbon dioxide (CO_2) emissions and limit emissions of chlorofluorocarbons (CFC) could reduce the global warming effect and protect the Earth's ozone layer.

To counter the destruction of nature, the U.N. Conference of Environment and Development (UNCED), or Earth Summit, will discuss a "convention on biodiversity" in Rio De Janeiro in June.

Experts note that the overfelling of rain forests might forever destroy plants containing substances which may help to heal people of cancer or of Aquired Immune Deficiency Syndrome (AIDS).

Economic factors along with ethical, ecological and biological ones are reasons enough for all nations to sign a compulsory accord on preserving species.

The Earth's biological diversity which developed over 600 million years ago continues to shrink despite progress in the field of environmental protection. The current "death rate" of species is about 100,000 times higher than before the human race began to subjugate nature.

In an effort to curb this development, industrial nations and developing ones have been locked in heated debates over biological and gene technologies, financial and technical aid as well as the issue of patents on seeds and living organisms.

"Biological diversity is no luxury", says Mr. John Ryan in a study for the World Watch institute that criticises mining activities, mass tourism and uncontrolled farming in natural reserves.

A number of biosphere reserves have been established worldwide, but a world convention should secure the use of "biological resources", he adds. The so-called third world wants to secure its economic growth. But the wealthy states mainly the United States, Western Europe, Canada and Japan — seek to apply for patents on seeds.

News From Japan

MERGER OF TWO MITSUI GROUP COMPANIES UNDER STUDY

Mitsui Toatsu Chemicals, Inc. and Mitsui Petrochemical Industries Ltd., are deliberating on a merger in an attempt to streamline their production/ marketing activities and improve the efficiency of R&D work and capital spending, thereby building up their international competitiveness.

Related details including the date and merger ratio are yet to be decided on. Considerable time is required before they can reach a final agreement. If implemented, the merger will result in the formation of Japan's top chemical company with annual sales of about ¥770 billion ($5,789 million), nearly equivalent to those of Mitsubishi Kasei — currently Japan's largest chemical manufacturer — and Sumitomo Chemical.

Mitsui Toatsu is a leading all-round chemical company supplying a wide variety of chemical products covering from plastics to chemical fertiliser and industrial-use chemicals. Mitsui Petrochemical is a main supplier of polyethylene and polypropylene. Combined, the number of their employees reaches a little less than 10,000.

Back of the planned merger are the slump in Japan's chemical operations, expected large declines in their pretax profits for the business term ending last year and intensifying international competition. The Japanese chemical industry includes many small-and medium-sized companies, who often suffer from excessive competition. There is, therefore, a generally held view that it is necessary to enhance the industry's international competitiveness by, for example, promoting mergers of chemical firms.

With regard to the envisioned merger, however, there are still many problems to solve. One of them is related to possible violation of the Antimonopoly Law. The merged company is expected to command an overwhelming market share (over 50 per cent) for phenol —raw material for agrochemicals and resins — and International Trade and Industry Minister K. Watanabe says: "The merger may pose a problem related to oligopoly".

The company will also become Japan's largest polypropylene supplier. In addition, there are differences between the two companies in wage systems and conditions of labor unions etc.

PROPYLENE SHORTAGE EXPECTED; GIVING IMPETUS TO PRICE TALKS

There are many indications that propylene supply will rapidly become tight in Japan after May since domestic oil refiners are scheduled to conduct periodic repairs on about 50 per cent of their fluid catalytic cracking equipment —accounting for 20 per cent of Japan's propylene production — in the period between April and June and operation of naphtha crackers is expected to be further reduced in response to supply-and-demand adjustment for polyolefin, which will move into top gear after April.

Japan's propylene demand is steady mainly for use in polypropylene production and propylene is being shipped to the Far East and Southeast Asia at a constant pace. Propylene prices have begun to rise in Europe and Asia, reflecting accidental suspension of a naphtha cracker (ethylene capacity: 300,000 t/y) in Libya: most of the product had so far been shipped overseas. In Southeast Asia, propylene prices have exceeded those for ethylene.

In the circumstances, major Japanese propylene makers including Nippon Petrochemicals are moving toward stepping up price-hike negotiations with users. They have hitherto endeavored to raise market prices by ¥5/kg (3.9c/kg) in compensation for increases in fixed costs and repair expenses.

The price talks concerned, however, have been bogged down due to the depressed economic situation in Japan. It is forecast that propylene prices for the October 1991 — March 1992 period will be settled according to the price trends for naphtha.

CHEMICAL INDUSTRY GROWTH EXPECTED TO DIP IN FY92

The average growth rate of Japanese industries for the current fiscal year will be as low as 2.7 per cent and the corresponding figure for manufacturing industries will be even lower at 2.3 per cent. Material-oriented manufacturing industries are projected to grow by 2.1 per cent for the present fiscal year and expand annually by 3.0 per cent on average in the coming five years.

These figures are given in a report on a questionnaire survey into company activities. According to the report, the growth rate of the chemical industry (organic/inorganic products) for FY92 is put at 2.5 per cent though it attained 4 per cent growth in the preceeding year. The corresponding rate for the chemical industry involved in pharmaceuticals and other products is projected to decline form 4.1 per cent to 3.3 per cent in the same period.

Combined capital spending planned by all Japanese industries is expected to rise annually by an average 4.6 per cent in the coming three years: the figure is a little less than half the corresponding average (10.9 per cent) recorded in the past three years. Corresponding figures for the chemical industry (organic/inorganic chemicals) are 3.4 and 10.7 per cent, respectively. They can be translated into 5.7 and 10.3 per cent for the chemical industry covering pharmaceu-

ticals and other products. Capital spending in the past three years was focused on capacity building (42.4 per cent), rationalisation/labour saving (25.1 per cent) and R&D promotion (14.0 per cent). The shares will be changed during the coming three years to 38.5, 29.1 and 15.7 per cent in the same order.

Employment will remain brisk. Almost half (47.2 per cent) of the replies to the questionnaire claim that they will expand employment in the coming three years but nearly half of respondents belonging to material-oriented manufacturing industries say that their employment will level off.

35% DROP LIKELY FOR 12 ETHYLENE CENTERS' TOTAL PRETAX PROFITS

Combined annual sales and pretax profits obtained by the 12 Japanese ethylene center firms in fiscal 1991 ending last March will come to ¥4,260 billion ($32 billion), down 1.5 per cent from the preceding year, and ¥114 billion ($857 million), down as much as 35 per cent, respectively.

The pretax profits-to-sales ratio concerned will drop from 4.1 per cent to 2.7 per cent almost equivalent to the FY85 or FY86 level. These figures were recently announced by the Ministry of International Trade and Industry. Surveys based on hearings held early in FY91 showed that their business results will be comparatively better than the abovementioned revised ones — sales: ¥4,370 billion ($33 billion), up 1 per cent and pretax profits: ¥117 billion ($880 million), down 22 per cent.

Drastic declines in their business performance are due mainly to a slump in their petrochemical operations. Japanese petrochemical demand has been shrinking considerably since last fall, and although the domestic industry has moved toward curtailing production, stocks are yet to decrease. Despite, sluggishness in domestic demand, plant operation rates for petrochemicals have been on an upward trend since last January, thus pushing down market prices.

It is, therefore, reported that Japan's petrochemical industry is "busy without profits". Their combined sales and pretax profits in FY90 amounted to ¥4,330 billion ($33 billion) and ¥176 billion ($1,323 million); the former dropped below the year-before level but the latter marked an all-time high. Petrochemical operations accounted for approximately 70 per cent of the said sales and profits.

UBE, BP CHEMICALS TIE UP FOR L-LDPE OPERATIONS

Ube Industries and BP Chemicals (U.K.) have agreed to jointly diversify their portfolios of linear low-density polyethylene (L-LDPE) and improve related production technology. The bilateral agreement will be renewed on a yearly basis.

The Japanese company thereby intends to develop special-grade products for use in moldings and high-tension electric cables. Its British counterpart expects the business tie-up to encourage licensing business. Ube has been operating since last year a 50,000 t/y L-LDPE plant based on the British firm's fluidized-bed process at its Chiba factory. The process is capable of producing a wide variety of L-LDPE grades and has already been licensed to 17 companies based in the States, Germany, Indonesia and Thailand.

BP Chemicals aims to completely adapt the technology to the Japanese market — believed to be the world's most exacting market in terms of demands product quality. Sales of L-LDPE as well as other versatile resins have stopped growing further in response to the business slump that began late last year but are projected to expand in the long term with demand centered on film-grade products. Ube is now building in Indonesia a 200,000 t/y L-LDPE plant for P.T. PENI, in whic BP Chemical is a leading shareholde The plant is also based on the B Chemical process.

1, 4-BUTANEDIOL PROJECT MOVES AHEAD: TONEN CHEMI CAL

Tonen Chemical Corp., is buildin production facilities for maleic anhy dride (35,000 t/y) and 1, 4-butanedio at its Kawasaki factory with completio slated for year-end. Approximatel 5,000 t/y of maleic anhydride are du to be supplied to Nippon Oil & Fats Co and most of the balance of 30,000 t/ will be fed to Tonen Chemical' 1,4-butanediol plant now under con struction.

The new plant is based on a brand new process developed by Davy McKe (U.S.). Tonen Chemical intends t emphasize, 1,4-butanediol production a part of its project for commercialisin higher value-added fine chemicals Demand for the product is steadil expanding for use in PBT resin an polyurethane, though it has stoppe showing rapid growth as in the past.

The company considers that it will be able to markedly enhance its competitive edge for 1,4-butanediol business by making the most of the infrastructure and supplies of butane, hydrogen and waste heat at the Kawasaki factory as well as the abovementioned excellent technology. The company aims to thrust deeply into the domestic market and exploit Asian markets where demand has begun to pick up.

EDC IMPORT DEPENDENCY RATIO IN 1991 RISES SLIGHTLY

Japan's ethylene dichloride (EDC) import-dependency ratio (a measure of how dependent the country is on imports of EDC) turned upward slightly from its downward trend of the last several years. The EDC-import-dependency ratio is a comparison

between EDC imports and domestic vinyl chloride monomer (VCM) (in terms of EDC) production. It fell to 31.5 per cent in 1990 but rose by 0.8 of a point to 32.3 per cent in 1991. EDC imports in 1991 registered 619,452 tons (up 2.9 per cent over previous year) and domestic VCM production recorded 2,298,968 tons (up 0.6 per cent).

Throughout 1989 and into 1990 major VCM manufacturers expanded production capacity successively and VCM capacity is now put at 2,400,000 tons a year. As a result, Japanese-made VCM increased sharply. Although around 600,000 tons a year of EDC have been imported, the EDC-dependency ratio dropped relatively.

The trend of the ratio is: 40.9 per cent in 1986; 38.4 per cent in 1987; 35.2 per cent in 1988; 34.2 per cent in 1989; and 31.5 per cent in 1990. From the long-term point of view, imports are likely to increase from the United States having olefin competitiveness, and the ratio will thus be on the upward trend.

IDEMITSU PETROCHEMICAL EYES PETROLEUM RESIN PRODUCTION

Idemitsu Petrochemical will start oil-resin production on a commercial basis. It will build facilities for annual production of 10,000 tons of oil resin at its Tokuyama plant by April, 1993. The investment concerned will be about ¥4,000 million. Using its own high-activity catalysts, this company has adopted a unique process to realise low-pressure hydrogenation.

As a result, it has been able to develop products excelling in heat resistance, cold resistance and adhesiveness. Because oil-resin production is to be started on a commercial basis, it will become possible to make effective use of C_5 fractions and aromatic fractions, leading to an improvement in the competitiveness of the company's olefin facilities.

Idemitsu Petrochemical aims at developing itself into an overall petrochemical manufacturer on the basis of olefin and aromatic chemicals. Until now it has developed derivatives enterprises for the respective fractions, beginning with C_2 and C_3. However, fractions with a great number of carbons remain unused. The company has been pushing its plan to start oil-resin production on a commercial basis, thinking that the strengthening of derivatives will lead to improvement in the competitiveness of olefin enterprises.

Domestic demand for oil resin amounts to about 30,000 t/y. Of the Japanese manufacturers concerned, Arakawa Chemical Industries, is able to supply 15,000 t/y, Tonex Co. (Tonen Chemical subsidiary), about 7,000 t/y, and Maruzen Petrochemical, about 3,000 t/y.

The total supply capacity of the three manufacturers is thus 25,000 t/y. There is an expanding market for hot melt adhesives, materials to give adhesiveness to tape, sheet for OPP and CPC, and film reformer. It is expected that competition in the market will stiffen further as a result of the entry of Idemitsu Petrochemical.

CARBON BLACK DEMAND IN 1992 TO DIP FOR 1ST TIME IN 6 YEARS

Total carbon black demand in 1992 is estimated at 796,000 tons, a decrease of 0.7 per cent from the previous year. This is the first expected decrease in six years. Carbon black demand continued growing for the fifth consecutive year, last year recording 801,666 tons (up 0.2 per cent over the year before) to hit an all-time high and exceed the 800,000-ton level for the first time.

This year, however, environment surrounding carbon black is severe as illustrated by sluggish expectations for production of automobiles/tires — the main use for carbon black. Demand for rubber-use carbon black in 1992 will continue to decrease to 740,000 tons (0.8 per cent drop).

That for non-rubber use is expected to register 49,300 tons (0.3 per cent gain), nearly unchanged from the previous year. Domestic demand is expected to decrease to 789,300 tons (down 0.7 per cent). Exports, favourable in the preceding year, are expected to reach 6,700 tons (up 0.2 per cent), unchanged from the previous year.

M'BISHI KASEI TO DOUBLE ACTIVE CARBON CAPACITY

Mitsubishi Kasei Corp. has almost reached a decision on doubling capacity for granular active carbon to cope with mounting needs for use in the treatment of waste water from manufacturing plants and sewage as well as pottable water and a variety of industrial-use solutions. The expanded capacity will be nearly 10,000 t/y (current capacity: 4,800 t/y).

The Japanese active-carbon market has been expanding steadily with use for water treatment expected to show double-digit growth in fiscal 1991 ending in March. Although demand has been shifting to powdered active carbon from the granular type, the latter has continued to record a year-on-year increase of 6 per cent on average mainly for use in water treatment and gas adsorption.

Observers see that the domestic active-carbon market has recovered completely. Mitsubishi is now operating the 4,800 t/y plant at its Kurosaki factory at full capacity. It claims that its granular active carbon features high levels of adsorbing capability, strength and reusability. It is considered that the current active-carbon boom, the second in the post-war era, has been caused by mounting social concern over shortage of pottable water and deterioration of water quality here.

TOA PAINT TO EXPAND POWDER COATING CAPACITY

Toa Paint Co. will raise production capacity for steel furniture-use powder coating by about 60 per cent to 3,600 t/y. Demand for powder coating —solvent-free paints — has been increasing due to the focus on the environmental pollution problem.

As the first step, a 750 t/y plant at the Mie factory will raise production capacity by 600 t/y, with completion scheduled for this August. Should the capacity build-up be successfully under way, the capacity will be additionally expanded by 800 t/y in total at the Mie and Ibaraki factories.

At present Toa Paint's powder coating production capacity is a total of 2,200 t/y. The powder coating is used for heavy-duty corrosion resistance, household electrical appliances and steel furniture as the largest outlet. Production is increasing steeply, reflecting an increase in demand for solvent-free paints. Therefore, supply tends to become insufficient.

MITSUBISHI PETROCHEMICAL TO PUSH EXPORTS OF POLYOLEFIN TO SE ASIA, CHINA

Mitsubishi Petrochemical Co. intends to stage export drives for polyolefin resin targeting the South-east Asian and Chinese markets as its new polyolefin plants at the Kashima factory will be put into regular operation around the beginning of the fall.

The firm says that marketing activities at its sales bases in Hong Kong and Singapore have been going well and it has also been building up relationships with major resin-processing companies in Southeast Asia.

The company is intent on exporting 70,000 tons of polyolefin resin this fiscal year or 10 per cent of its total production capacity. The firm's 2nd-phase petrochemical project at its Kashima factory is now in the final stage.

The project is intended to build plants for ethylene (300,000 t/y), polyolefins, ethylene oxide, ethylene glycol and benzene. The polyolefin plants are for direct-chain low-and high-density polyethylene (80,000 t/y); co-production type) and polypropylene (80,000 t/y).

These plants are scheduled to be completed by the end of May and put into commercial operation early in autumn. Their completion will bring the company's combined polyolefin capacity to about 700,000 t/y. The co-production plant for L-LDPE and HDPE utilises the vapor-phase process Mitsubishi Petrochemical has adopted for the first time, with emphasis placed on mass production of high-density HDPE film.

The PP plant of the vapor-phase process is to mainly produce block copolymers. The firm sees Asian countries, particularly China, growing to be good markets for its polyolefin resin.

ROK's DAELIN LDPE, PP PROJECTS TO ACCELERATE OVERCAPACITIES

It is likely that oversupply of polyolefin in South Korea will be accelerated further amid growing concern over the already flooded ethylene and derivative markets. Daelim Industrial Co. of Korea has begun preparing for construction of a 100,000 t/y low-density polyethylene (LDPE) plant as the 2nd-phase project in the form of a joint venture with C. Itoh and Co. and Tosoh Corp. of Japan.

The Korean firm will be licensed LDPE technology from Montecatini of Italy for the 100,000 t/y plant, with completion set early in 1994. A licenser of PP technology, Daelim's another project, is still to be decided but is likely to be a Montecatini group firm. To prevent further growth in excessive capacities of ethylene and its derivatives, the South Korean government recently announced a policy of not approving plans for expansion and new plant construction of ethylene and its derivatives. This, however, does not cover Daelim's projects as they had been applied for before this announcement.

In a bid to grow to and become a comprehensive petrochemical maker, Daelim is now building a 100,000 t/y LDPE plant using ICI process and an 80,000 t/y PP plant with Himont a Montecatini subsidiary technology.

TEC BUILDING 10,000 T/Y EPOXY RESIN PLANT

Thai Epoxy Allied Products Company (TEC; Thailand), owned 11 per cent by Tohto Kasei Co., has been constructing a 10,000 t/y epoxy-resin plant at Map Ta Phut in the eastern part of Thailand. The plant is expected to be completed at the end of April and to go into operation on a full scale from June.

The 10,000 t/y capacity breaks down into: general-purpose liquid epoxy, 6,400 tons; general-purpose solid epoxy, 1,800 tons; and bromine-based special epoxy, 1,800 tons.

Initially about half of the production will be allotted to the Southeast Asian market. However, since domestic demand in Thailand is rapidly expanding, a domestic-demand-first policy will eventually be adopted.

Kuk Do Chemical Industry Co. —Tohto Kasei's subsidiary in Korea —has expanded production capacity to 25,000 t/y. In Djakarta, Indonesia, Tohto Kasei is constructing a 5,000 t/y plant by means of a joint venture with a local financial combine in Indonesia and China Petrochemical Development Corporation (Taiwan).

New Developments from Japan

USE OF HIGH-TEMPERATURE CO_2 FROM POWER PLANTS AIMED AT

The Ministry of International Trade and Industry (MITI) will embark on R&D on technology for separating and reusing the high-temperature carbon dioxide (CO_2) given off from power plants etc. The key point about this project is to develop a filter which can withstand high temperature of 800-900°C.

The project is intended to reduce the high-temperature CO_2 to CO at high temperature (without reducing the temperature) by means of a high-temperature-resistant filter and utilise it (CO) as fuel. Japan Fine Ceramics Center (JFCC) will be commissioned the task to undertake fundamental research for the 2-year project. Japan Fine Ceramics Association (JFCA) will also be responsible for development of a whole system required. A MITI official says that the technology, if established, will make it possible to utilise CO_2 now seen as a social threat, helping to protect the earth's environment.

There has so far been no filter available that can separate CO_2 efficiently and withstand high temperatures of 800-900°C. Ceramic is a good candidate for it. JFCC will test a variety of materials to find a suitable substance meeting the specifications required.

JFCC is now recruiting researchers in the academic, private and government sectors to be involved in the project, R&D work is likely to start in or after the summer. MITI is also supporting an R&D project to separate and utilise waste CO_2 whose temperature is comparatively low (200-300°C), without reducing the temperature.

HIGH HOPES PLACED ON HEAT-RESISTANT CERAMICS: REPORT

It is necessary to develop highly reliable structural/functional materials (fine ceramics) for use in aerospace: they are required to endure high temperatures of up to 1,500-1,700°C and, to this end, monitor their own conditions, repair themselves and respond to environmental changes.

This is revealed in an interim report on technical forecasts for fine ceramics, which was recently compiled by a study group of Japan Fine Ceramics Association.

The forecasts are based on user needs in all industrial sectors. The car industry, the report claims, calls for the supply of lightweight, heat-insulating, recyclable and environmentally friendly ceramics.

MARKET INFORMATION

Citric acid eases further

Prices of citric acid eased further in the Bombay Chemicals Market during the week under review. Prices were quoted at Rs. 43 per 5 kg. Rangolite (China) was also down by Rs. 8/- per kg. with improved deliveries. Titanium dioxide (Anatase) was up by Rs. 5/- and aniline oil also firmed up. In the dye intermediates section prices hovered around the previous week's levels. Offtake was moderate.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on May 26, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.25
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	5.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	112.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	6.00
Borax (Granular)	38.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	85.00
Butyl carbitol	110.00
Caustic soda (Flakes)	18.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	5,000.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	180.00

Hydro	60.00
Hyflosupercell	48.00
Hexamine (Resale)	32.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	47.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	200.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	40.00
Phthalic anhydride (Resale)	41.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	72+ST
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	75.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	115+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	17.50
Acetic Anhydride (Resale)	35.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	70.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.0
Benzo trichloride	16.0
Benzoyl chloride	22.0
Bromine Liquid	115.0
Chloroform	65.0
Carbon Tetrachloride	27.0
Cellosolve	70.0
Cyclohexanone	80.0
Cyclohexanol	85+S
Diacetone (Resale)	29.0
Diethyl Oxalate	34.0
Diethyl glycol (DEG) (Resale)	42.00
Dioctyl Phthalate	69.00
Diallyl Phthalate	44.00
Dimethyl Phthalate	48.00
Dioctyl Adipate	58.00
Dibutyl Adipate	42.00
Dipentene	15.00
Dimethylamine 40%	30.00
Dimethylamine 50%	35.00
Ethyl Acetate	27.00
Ethyl Acrylate	92.00
Ethylene Dichloride	21.00
Ethylene Glycol	32.00
Formic Acid (Imp.)	34.00
Formaldehyde (Resale)	7.75
Glycerine (CP)	70.00
Glycerine (IW)	65.00
Hydrogen Peroxide 50% (Resale)	47.00
Isopropyl Alcohol	45.00
Isobutyl Alcohol (Resale)	35.00
Monoethanolamine (Resale)	95.00
Melamine	62.00
Methyl Ethyl Ketone	60.00
Methyl Isobutyl Ketone	60.00
Methyl Acrylate	72.00
Methylene Dichloride (Resale)	30.00

Carbitol	115.00+ST
Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	68.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	18.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	18.50
Xylene (Ortho)	31.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	92.00
Alpha Naphthol (Imp.)	230.00
Aceto Acetic Ester (Methyl)	140.00
Acetanilide	62.00
Anthraquinone	135.00
Anthranilic Acid	115.00
2-Amino 4-Nitrophenol	160.00
Blue B. Base (Local)	330.00
Beta Naphthol	75.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid (IDI)	650.00
BON Acid	130.00
CPC (Crude)	115.00
Chicago Acid (Atul)	350.00
Coach Acid	68.00
Cyanuric Chloride (German)	265.00
DEMAP	275.00
2,4-DNCB	35.00
Dichlone (Imp.)	450.00
Dimethyl Aniline	85.00
Diethyl Aniline	145.00
Diethyl Sulphate (Japan)	93.00
Diethyl Sulphate (Local)	80.00
Diamino stilbene disulphonic acid	210.00
3,3-DCB	260.00
Diphenylamine (U.K.)	155.00
Gamma Acid (Atul)	225.00
Gamma Acid (Local)	175.00
H. Acid (Atul)	160.00
G. Salt	82.00
J. Acid	375.00
J. Acid Urea	450.0
K. Acid	125.0
MPDS (Local)	155.0
MNA	130.0
Meta Ureido Aniline	190.0
MPD (Local)	175.0
MPD (German)	210.0
N-Methyl J. Acid	515.0
N-Methyl Aniline	125.0
Naphthalene (Refined)	31.5
Ortho Anisidine (OA) (Imp.)	108.0
Ortho Dichloro Benzene (ODCB)	22.0
OT Base	170.0
OT Liquid	75.0
Para Dichloro Benzene (PDCB)	40.0
Para Anisidine (PA local)	160.0
PNA	95.0
Para Cresidine (Imp.)	330.00
Para Amino Azo Benzene (India)	135.00
PNCB (HOC)	50.00
Para Nitro Toluene	85.00
1-Phenyl 3-Methyl 5-Pyrazolone	175.00
Phenyl J. Acid	415.00
PT Base	165.00
Rhoduline Acid	600.00
Resist Salt 80%	26.00
Resorcinol	350.00
Sodium Naphthionate	85.00
5-Sulpho-Anthranilic Acid	115.00
Sulphanilic Acid	35.00
Sulpho Tobias Acid	155.00
Tobias Acid (Imp.)	115.00
Metanilic Acid	48.00
MTD (German)	185.00
Vinyl Sulphone	125.00

Bombay Drugs Market

(Prices as on May 26, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	600
Aluminium Hydroxide IP	43
Ampicillin Sodium	4400
Ampicillin Trihydrate	3250
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2775
Analgin	320
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1450
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium Lactate	30
Calcium D Pantothenate	1525
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2750
Chlorpropamide	235
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3100
Cimetidine	3350
Citric Acid IP	90
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	2000
Diclofenac Sodium	2400
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	365
Disodium Hydrogen Citrate	110
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2700
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	800
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	125
Hydroxylamine HCl	600
Hydroxylamine Sulphate	108
Ibuprofen IP	470
Imipramine HCl	5000
Indomethazine	1100
I.N.H.	375
Inositol IP	1400
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	110
Lactic Acid (Japan)	165
Levamisole	2000
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	160
L. Lysine Pharma Grade	260
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	315
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	325
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	500
Metronidazole Benzoate	475
Morpholine	180
Neomycine Sulphate	4200
Niacin	300
Niacinamide	385
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4700
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	148
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	225
Piperazine Hexahydrate	180
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2100
Pyroxicam	3100
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	260
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	840
Sulphacetamide Sodium	370

Product	Rs./kg
Sulphadoxine	290
Sulphamethoxazole	375
Sulphasomidine	475
Sulphaphenazole	325
Terbutaline Sulphate	30000
Tinidazole	480
Theophylline Anhydrous	415
Thiacetazone	325
Thoridazine HCl	20000
Thycol (Potassium Gluconate Sulphate)	500
Tolbutamide	225
Trifluopromazine HCl	11000
Trifluoperazine HCl	12500
Trimethoprim IP	1875
Tween 80	275
Vitamin B6 Hydrochloride	3000
Vitamin B2 5-Phosphate	4500
Vitamin K-3 (Water soluble)	750

DRUGS INTERMEDIATES

Product	Rs./kg
1-Amino-4-Methyl Piperazine	1400
2-Aminopyridine	575
Beta Picoline	230
2-Chloro Propionic Acid	50
2-Chloro Propionic Chloride	80
3-Chloro 4-Fluoro Aniline	1375
2:4-Dichloro Benzoic Acid	550
2,6-Dichloro Aniline	775
3,4-Diamino Benzophenone	470
Diethyl Malonate	95
Diethyl Oxalate	45
Dimethyl Acetamide	175
Dimethyl Amino Ethyl Chloride HCl	220
Dimethyl Dichloro Silane	195
Dimethyl Sulphoxide	190
Furoic Acid	165
Isobutyl Benzene	190
Lasamide	950
2,6-Lutidine	1800
1-Methyl 1-Amino Methyl Thio 2-Nitro Ethane	1550
2-Methyl 5 Nitro Imidazole	180
Methyl Acetoacetic Ester	160
Methyl Chloro Formate	100
Methyl Isothiocyanate	400
Nitromethane	200
N-Butyl Diethyl Malonate	170
N-Methyl Piperazine	850
Ortho Nitro Benzaldehyde	1400
Para Chloro Benzoic Acid	150
Para Hydroxy Acetophenone	800
Para Hydroxy Phenyl Acetamide	1800
Pivaloyl Chloride	410
Propionic Anhydride	280

Bombay Dyes Market

(Prices as on May 26, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.1
Dark Brown 3B	411.1

BASE COLOURS	Per Kg
Fast Yellow GC	77.7
Fast Orange GC	128.4
Fast Scarlet R	198.0
Fast Scarlet RC	128.4
Fast Scarlet RCR	105.6
Fast Scarlet G	115.7
Fast Scarlet GN	92.9
Fast Scarlet GG	77.7
Fast Scarlet GGS	73.9
Fast Red B	233.5
Fast Red RC	115.7
Fast Red R Flakes	158.8
Fast Red TR	181.6
Fast Red TR Oil	223.3
Fast Red RL	251.2
Fast Red KB Oil	251.2
Fast Bordeaux GP	236.0
Fast Garnet GBC	103.0
Fast Violet B	548.8
Fast Blue BB	566.5

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: MAY 22 (NNS) An easy-to-firm tendency was noticed in the local chemicals market during the week under review. In the absence of import coupled with depleted stock in the market, mercury registered a marked rise of Rs. 400 at Rs. 8,200 per flask. On emergence of renewed buying support, paraffin wax ended the week with a gain of Rs. 45 at Rs. 1,120 per 50 kg. Following restricted supplies coupled with better consumers support, menthol bold showed a gain of Rs. 10 at Rs. 275 per kg. and menthol flake and medium quality also marked up by Rs. 12/13 at Rs. 248 and Rs. 265 per kg. respectively. Menthol oil was also quoted higher by Rs. 3 at Rs. 165 per kg. Stockists support in menthol was also reported better.

Titanium dioxide TTP improved slightly by Rs. 1 at Rs. 72 per kg. while titanium dioxide RC-822 maintained its last week closing of Rs. 96 per kg. On better buying support from detergent powder manufacturers, tri-sodium phosphate spurted by Rs. 25 at Rs. 650 per 50 kg. while sodium hydro sulphite prices remained firm. On offerings by the stockists coupled with slack consumers support, chatkolite and Rangolite Germany slipped by Rs. 2/5 at Rs. 72 and Rs. 115 per kg. respectively. Safolite also lost Rs. 1 at Rs. 79 per kg. On arrivals of sufficient quantities of Modi and Gwalior Rayon coupled with lack of support, caustic soda flakes marked down by Rs. 15 at Rs. 810/820 per bag of 50 kg. On good offerings of citric acid China coupled with lack of follow up support, it suffered a setback of Rs. 350 at Rs. 4,550 per 50 kg. Due to restricted supplies by the manufacturers, citric acid Bombay Dyeing shot up to Rs. 5,500 from Rs. 5,300 in the beginning of the week, but later reverted back to previous closing of Rs. 5,300 due to poor offtake. Due to weak demand coupled with offerings of imported goods, tartaric acid France declined by Rs. 16 at Rs. 490 per kg. For want of enquiries, camphor thal slipped by Rs. 2 at Rs. 138 per kg. while camphor powder remained firm at its last week closing of Rs. 122 per kg. Demand for other chemicals at their previous closing was reported thin, as trading community has invested huge amount in shares.

(DELHI MARKET RATES AS ON MAY 22, 1992)

Ammonia Bicarb (Per 25 Kg.)	178.00
Mercury (Per flask)	8,200.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	810/820.00
Citric acid (Per 50 Kg.)	4,550/5,300.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCl (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	415/425.00
Sod. Hydrosulphite (Per Kg.)	55.50/65.00
Rangolite (Per Kg.)	115.00
Safolite (Per Kg.)	79.00
Chatkolite (Per Kg.)	72.00
Decolite (Per Kg.)	96.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,900.00
Paraffin Wax (Per 50 Kg.)	1,120.00
Slack wax (Per metric tonne)	12,500.00
Tartaric Acid (France Per Kg.)	490.00
Borax Granular (Per 50 Kg.)	1,700.00
Borax Crystal (Per 50 Kg.)	1,950.00
Sodium Nitrite (Per 50 Kg.)	725/800.00
Sodium Nitrate (Per 50 Kg.)	530.00
Camphor Thal (Per Kg.)	138.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	275.00
Menthol Medium (Per Kg.)	265.00
Menthol Flake (Per Kg.)	248.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	165.00
Glycerine (Per Kg.)	65.00/70.00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.00
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	43.50/44.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (50 Kg.)	650.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	72.00
Titanium Dioxide RC-822 (Per Kg.)	96.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	N.A.
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	57.00/67.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	31.75/32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,200
Match Wax	17,000.00
Residue Wax	8,300.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T.	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

There was only moderate activity in the Dyes and Chemicals Market at Madras. Cash flow has been one of the main constraints and contributing factor for the low volume of trade. Caustic prices are showing a tendency to come down on account of keen competition. The likely imposition of power cut in Maharashtra had very little impact on the prices.

(MADRAS MARKET RATES AS ON MAY 23, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.25
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	44.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	16.00
Barium Chloride (per kg)	15.00
Bleaching Powder (per 50 kgs)	320.00
Borax (per kg)	32.00
Boric Acid (per kg)	60.00
Calcium Chloride Solid (per kg)	4.00
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	8.00
Calcium Carbonate (Precipitated) (per kg)	7.00
Caustic Soda Flakes (per kg)	17.25
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	38.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.00
Ferrous Sulphate Crystal (per kg)	5.50
Hydros (TCPL) (per kg)	58.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	44.00
Hyflosupercell (per kg)	46.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	28.00
Magnesium Chloride (per kg)	4.00
Magnesium Sulphate (per kg)	4.00
Mercury (per 34.5 kgs)	7,800.00
Nickel Chloride (per kg)	200.00
Nickel Sulphate (per kg)	210.00
Phosphoric Acid (per kg)	35.00
Potassium Carbonate (per kg)	36.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	525.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	10.00
Sodium Sulphite (per kg)	17.00
Sodium Bisulphite (per kg)	14.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	17.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	27.00
Trisodium Phosphate (per kg)	16.00
Titanium Dioxide (Anatase) (per kg)	66.00
Titanium Dioxide (Rutile) (per kg)	95.00
Zinc Chloride (per kg)	22.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	16.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	36.00
Acetic Acid (per kg)	22.00
Acid Slurry (per kg)	36.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	120.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	67.00
Glue Flakes (per kg)	18.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	46.00
Menthol Crystals (per kg)	280.00
Oxalic Acid (per kg)	17.00
Pentaerythritol (per kg)	66.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	215.00
Phthalic Anhydride (per kg)	44.00
Sodium Acetate (per kg)	14.00
Sodium Alginate (per kg)	250.00
Sorbitol (per kg)	27.00
Urea (Technical) (per kg)	4.00

SOLVENTS

Acetone -- HOCL (per kg)	33.00
Benzene (per litre)	24.00
Butanol (per kg)	58.00
Butyl Acetate (per kg)	54.00
Carbon Tetra Chloride (per kg)	27.00
Cellosolve (per kg)	75.00
Chloroform (per kg)	35.00
Diacetone Alcohol (per kg)	46.00
Diethylene Glycol (per kg)	44.00
Di-butyl Phthalate (per kg)	66.00
Di-octyl Phthalate (per kg)	70.00
Ethyl Acetate (per kg)	27.00
Isopropyl Alcohol (per kg)	44.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	29.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	55.00
Octanol (per kg)	75.00
PEG 400 (per kg)	72.00
Perchloroethylene (per kg)	40.00
Propylene Glycol (per kg)	67.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	37.00
Toluene (per kg)	24.00
Xylene (per kg)	30.00

CALCUTTA MARKET
(Prices as on May 24, 1992)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	2,750.00
Camphor (per kg)	92-94.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	800.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	285.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3.250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Department of Agriculture, Attn: Director of Agriculture, Office of the Director of Agriculture, Chepauk, Madras 600 005.	Ferrous sulphate Manganese sulphate Copper sulphate Borax Sodium molybdate (On rate contract basis).	360 MT 250 MT 25 MT 180 MT 3.20 MT		4.6.92
Maharashtra Agro-Industries Devt. Corporation Ltd., Attn: Managing Director, Noga & Export Division, 3rd Floor, Rajan House, Prabhadevi, Bombay 400 025.	HDPE white carboys (50 litre capacity)	1800 Nos.		4.6.92
	Pectin	4 MT		18.6.92
	Citric acid (monohydrate) Food Grade	5 MT		18.6.92
Oil & Natural Gas Commssion, Attn: Sr. D.D. (S&P), Operation Business Group/WSS, Ahmedabad Project, Sabarmati, Ahmedabad 380 005.	Hydrochloric acid		AMD/SP/WSS/MC/3/92-93	25.6.92
	Calcium chloride		AMD/SP/OBG/MC/12(4)/91	27.7.92
Punjab State Electricity Board, Attn: Exec. Engr., Procurement, 116-G, Bhai Randhir Singh Nagar, Ludhiana 141 001. Punjab.	Di tert butyl para cresol (D.B.P.C. -- antioxidant compound conforming to IS-9207).	500 KG	SE/TMR/LDH/TE-201	2.7.92
The Travancore Sugars & Chemicals Ltd. Attn: Director & Gen. Manager, Valanjavattom, Tiruvalla, Pthanamthitta (Dist.), Kerala.	Rectified spirit (To be supplied to: (1) Travancore Sugars & Chemicals Ltd., Valanjavatoom, Tiruvalla; (2) Co-op. Sugar Mills, Menonpara, Pallakad; (3) Mannam Sugar Mills Co-op. Ltd., Panadalam.	100 lakh bulk litres		10.6.92
PLANT & EQUIPMENT				
Engineering College, Attn: The Registrar, Kota-9, Rajasthan.	Digital contamination monitor oscilloscope		NE/4	19.6.92
Sardar Patel University, Attn: Head, Chemistry Dept., Vallabh Vidyanagar 388 120, Gujarat.	UV-VIS recording spectrophotometer 200-1200 nm or nearby. UV-VIS-NIR recording spectrophotometer range 200-3500 nm or nearby with Reflectance Attachment. Multifrequency ultrasonic interferometer (1-12 MHZ)			16.6.92

INTERNATIONAL BULK CHEMICAL PRICES

SPOT PRICES AS ON MAY 6, 1992

Product	European Price range	US Price range
Naphtha	$187-189/m.t. (cif)	
Gasoil	$182-183/m.t. (cif)	
Propane		28.75-29 cts/gal (fob)
Butane		33.75-34 cts/gal (fob)
Ethylene	$390-400/m.t. (cif)	14.5-15.5 cts/lb (del)
Propylene — Chemical grade	DM600-620/m.t. (cif)	13-14 cts/lb (del)
Polymer grade	DM640-650/m.t. (cif)	14.5-15 cts/lb (del)
Butadiene	$220-230/m.t. (fob)	12-13 cts/lb (cif)
Benzene	$360-365/m.t. (fob)	$1.18-1.20/gal (fob)
Toluene	$290-305/m.t. (fob)	90-92 cts/gal (fob)
Xylenes — Virgin	$300-310/m.t. (cif)	
Solvent	$295-305/m.t. (fob)	90-92 cts/gal (fob)
Para-xylene	$375-385/m.t. (fob)	18-19 cts/lb (fob)
Ortho-Xylene	$375-385/m.t. (fob)	17-18 cts/lb (fob)
Styrene — T1	$480-490/m.t. (fob)	
T2	$505-515/m.t. (fob)	19.75-20.25 cts/lb (fob)
Methanol — T1	$95-105/m.t. (cif)	
T2	DM180-190/m.t. (fob)	36-38 cts/gal (fob)
MTBE	$340-345/m.t. (fob)	85-88 cts/gal (fob)
Phenol	$400-410/m.t. (fob)	19-22 cts/lb (fob)
VCM	$290-300/m.t. (fob)	18 cts/lb (fob)
Fibre Intermediates		
Ethylene glycol	$335-345/m.t. (fob)	16-17 cts/lb (fob)
Acrylonitrile	$630-640/m.t. (fob)	$600-640/m.t. (fob)
Solvents		
IPA	DM810-850/m.t. (del)	22-24 cts/lb (fob)
MEK	DM750-780/m.t. (del)	27-32 cts/lb (fob)
Acetone	DM650-690/m.t. (del)	16-22 cts/lb (fob)
Ethyl acetate	DM1,240-1,300/m.t. (del)	36-38 cts/lb (fob)
Butyl acetate	DM1,230-1,260/m.t. (del)	36-37 cts/lb (fob)

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
			BOMBAY PORT	
1/6	Oyster Bay	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	4/6
1/6	Lanka Amitha (V-26/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	4/6
6/6	Halberstadt (Ger) (Voy-979)	Marine Trans/	Limmassol; Larnaca; Izmir; Mersin; Istanbul; Marseilles; Valencia; La Spezia; Casablanca; Piraeus; Salonica; Beirut; Tripoli (Lebanol). (Carting at E-Shed Grain Depot).	9/6
		Trident/	U.K., N. Cont., Scan. & Med. Ports. (Carting at 12B-ID).	
		Merzario/	Jeddah; Ravenna; Venice; Trieste; Ancona; Mersin; Limmassol; Pieraeus; Alexandria. (Carting at M.O.D. No. 2).	
		Penguin/	Aqaba. (Carting at M.O.D. No. 1).	
		Patvolk	Aqaba. (Carting at Frere Basin No. 1).	
3/7	Robert E Lee	M.S.P.L.	Assab. (Carting at P/Q-PD).	3/7
10/6	Ravidas	S.C.I.	Aden	15/6
12/6	Indira Gandhi	Transocean	Antwerp; Rotterdam; Rabzon; Odessa; and Black Sea Ports. (Carting at C-PD).	14/6
15/6	Tibor Szamuely (Russ) (Voy-127 W/B)	Transocean	Illyichevsk; Odessa; Izmail; Reni (USSR); Russe (Bulgaria); Galatz (Romania); Budapest (Hungary); Bratislava (Czechoslovakia); Pancevo; Belgrade/Beograde (Yugoslavia); Linz; Vienna (Austria); Deggendorff; Regensborg (Germany). (All Ports on River Danube). (Carting at N/O G-PD).	17/6
6/6	Halberstadt (Voy-979)	P&O/	Dubai; Abu Dhabi; Muscat; Doha. (Carting at Timber Pond No. 4).	9/6
		Spoonbill/	Dubai; Sharjah; Ajman; Umm-Al-Quwain; Ras-Al-Khaimah; Abu Dhabi; Doha; Bahrain; Kuwait; Muscat; Bandar Abbas. (Carting at F.B. No. 1).	
		Patvolk/	Dubai; Muscat; Bahrain. (Carting at Frere Basin No. 1).	
		Silvership/	Dubai; Sharjah. (Carting at Frere Basin No. 1).	
		Penguin/	Dubai; Dammam; Riyadh; Abu Dhabi; Sharjah; Doha; Muscat; Jebel Ali; Bahrain; Kuwait; Bandar Abbas. (Carting at F.B. No. 5 & 6).	
		Merzario/	Dubai; Muscat; Sharjah; Doha; Abu Dhabi; Kuwait; Bahrain. (Carting at M.O.D. No. 2).	
		M.S.P.L./	Dubai; Fujairah; Khorfakkan; Sharjah; Abu Dhabi; Muscat. (Carting at 5 & 6)	
		SDS Corpn./	Muscat; Bahrain; Kuwait; Dubai; Sharjah; Abu Dhabi. (Carting at E.G. Depot).	
		Mercator	Dubai; Abu Dhabi; Sharjah; Jebel Ali; Fujairah. (Carting at F.B. No. 1).	
26/5	Dove	U.L.A.	Dubai; Abu Dhabi.	30/5
10/6	Hafez	J.M. Baxi	Bandar Abbas; Bandar Khomeini.	15/6
4/6	Sea Wind	I.L.S.A.	Dubai.	10/6
26/5	Stavonikos	H.S.A.	Sharjah (Reefer only).	5/6
4/6	Eagle Nova (Voy-066)	F.F.C. Co.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver (B.C.); New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Chicago; Atlanta; Philadelphia; Milwaukee; Dallas; Guam; St. Louis; Wilmington (B.C.); San Diego; Indianapolis & Central American Ports; Honolulu. (Carting at Timber Pond No. 3).	9/6
6/6	Supanya (V-57 W/E)	Samrat	Longbeach; Oakland; Seattle; Los Angeles; San Francisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; Vancouver; Montreal; Toronto; New Orleans; Houston. (Crtg. at B-PD).	9/6

(1)	(2)	(3)	(4)	(5)
30/5	Ocean Sirius (V-42 A/B)	O.S.A./	New York; Philadelphia; Baltimore; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma; & S. American & W. Indies Ports. (Carting at B. Pier Extn.).	8/6
		Contfreight/	New York; Wilmington; Charleston; Baltimore; Savannah; Norfolk; Philadelphia; Los Angeles; San Francisco; Oakland; Seattle. (Only FCL). (Carting at Frere Basin).	
		U.L.A.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; West Indies Ports. (Carting at B-PD).	
2/6	Mulbera	Killick	South Amercian Ports. (Carting at Frere Basin No. 2).	5/6
3/7	Robert E Lee (USA)(Voy-65)	M.S.P.L.	Norfolk; New Orleans; Houston; Savanna; New York. (Carting at P/Q-PD).	3/7
11/6	Kota Petani (V-2205)	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orleans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American & Pacific Ports. (Carting at B-PD).	14/6
		Trident	S. American; Carribbean & Central American Ports. (Carting at 12B-ID).	
2/6	Mulbera	Killick/ P&O	Melbourne; Sydney; Brisbane; Adelaide; Fremantle; P. Hobart; Devon; P. Launceston; Burnie; New Plymouth; Auckland; Wellington; Lyttleton; P. Chalmers; Christchurch; Dunedin; Napier. Also all Pacific Island. (Carting at Frere Basin No. 2 for Killick and T.P. No. 4 for P&O).	5/6
		F.F.C. Co.	Auckland; Lyttleton; Sydney; Melbourne; Fremantle; Adelaide; Brisbane. (Carting at Timber Pond No. 1).	
11/6	Kota Petani (V-2205)	J. Mackintosh/ Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 2 for J. Mackintosh) (Carting at 12B-ID for Trident).	14/6
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S./	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari.	Melbourne; Sydney; Brisbane. (Carting at F.B. No. 3).	
1/6	Oyster Bay (V-4670)	Arebee/	Dar Es Salaam & Mombasa (Direct); Re Union; Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Walvis Bay (Namibia); Zanzibar. (Carting at M.O.D. No. 1).	4/6
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Crtg at TP 4).	
4/6	Pioner Belorussii	Sai Ship	Mombasa; Dar Es Salaam (Direct); Zanzibar; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at M.O.D. No. 2).	8/6
6/6	Vishva Kaumudi	S.C.I.	(Seychelles); P. Louis. (Carting at B. Pier Extn.).	12/6
7/6	Allamanda (V-004)	G.O.S.	P. Louis; Re Union; (Tamatave). (Carting at F.B. No. 1).	12/6
1/6	Oyster Bay	P&O	Colombo. (Carting at Timber Pond No. 4).	4/6
2/6	Mulbera	P&O/ Killick	Colombo. (Carting at Timber Pond No. 4). (Carting at Frere Basin No. 2).	5/6
15/6	Tibor Szamuely	Transocean	Karachi (Afghanistan). (Carting at N/O-PD & G-PD).	17/6
4/6	Eagle Nova (V-066)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong; Manila; Keelung; Kaohsiung; Main Japan Ports; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at T.P. No. 1).	9/6
2/6	Mulbera	Killick/P&O/ F.F.C. Co.	Singapore. (Carting at F.B. No. 2 for Killick & T.P. No. 1 for P & O) (Carting at T.P. No. 1 for F.F.C. Co.).	5/6
6/6	Supanya (V-57 W/E)	F.F.C. Co.	Singapore; Jakarta; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at T.P. No. 1).	9/6
		Samrat	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Thaichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo; Haipong; Ho Chi Minh City. (Carting at B-PD).	

(1)	(2)	(3)	(4)	(5)
30/5	Ocean Sirius (V-42A/B)	M.S.P.L./	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Surabaya. (Carting at F.B. No. 5&6).	8/6
		Congfreight/	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Only FCL). (Carting at Frere Basin).	
		U.L.A.	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese Ports. (Carting at B-PD).	
3/7	Robert E Lee	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	3/7
11/6	Kota Petani (V-2205)	J. Mackintosh/	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang; Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Battar; Yokohama; Nagoya; Kobe; Ho Chi Min; Main Chinese Ports. (Carting at Frere Basin No. 2).	14/6
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 12B-ID).	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at B-PD).	
		Silvership/	Far East Ports. (Carting at F.B. No. 1).	
		Beacon/	Far East Main Japan & Chinese Ports. (Carting at E-Shed Grain Depot).	
		Lucky Mari.	Singapore; Penang; P. Kelang; Bangkok; Manila; Surabaya;; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kaohsiung; Keelung; Busan; & Chinese Ports. (Carting at F.B. No. 3).	
15/6	Tibor Szamuely	Transocean	Singapore; Bangkok; Saigon. (Carting at N/O-PD & G-PD).	17/6
			KANDLA PORT	
28/5	Capt. Ali	Prabhat/Seanav	Dammam.	5/6
1/6	Oktay Tarik (V-3)	Prabhat/Seanav	Jeddah; Aqaba.	8/6

VESSELS DUE FOR IMPORT DISCHARGE (BOMBAY)

Due Date	Steamer's Name	Agents	From
11/6	Kota Petani (V-2205)	J. Mackintosh/Trident/E.S.P.L./ Confreight/	Far East/Red Sea/East Africa
12/6	Hoegh Dyke (V-0613)	Patvolk	U.S.A./Canada; Jeddah.
4/6	Pioner Belorussii	Sai Ship	E. Africa
10/6	Ravidas	S.C.I.	U.K. Cont.
15/6	Tibor Szamuely (V-127)	Transocean	Russia & E. Europe
4/6	Vishva Pankaj	S.C.I.	U.K. Cont.
10/6	Vishva Prafulla	S.C.I.	Canada/USA
10/6	Vishva Mohini	S.C.I.	U.K. Cont.

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

MATERIALS IMPORTED
BOMBAY
(28.4.92)
(Continued from previous issue)

CARBOXY METHYL CELLULOSE: From USA: Mul Dentpro Pvt. Ltd., 997.91 Kgs., Rs. 1,74,321; Mul Health Care Products P. Ltd., 997.91 Kgs., Rs. 1,74,321.

CARNAUBA WAX: From Brazil: Pharma Chem Associates, 14,000 Kgs., Rs. 4,59,550.

CYANURIC CHLORIDE: From Belgium: Akash Purochem P. Ltd., 1,000 Kgs., Rs. 98,068, Anil Inds., 1,000 Kgs., Rs. 98,068; Associated Intermediates & Chemicals, 1 Mt., Rs. 98,068; Atlas Dye-Chem Inds., 2,000 Kgs., Rs. 1,96,135; Babson Chemicals, 2,000 Kgs., Rs. 1,96,135; Chemiequip, 1,500 Kgs., Rs. 1,47,101; Durga Dye Chem, 500 Kgs., Rs. 49,033; Jagson Industries, 500 Kgs., Rs. 49,033; Janke Dye-Chem P. Ltd., 500 Kgs., Rs. 49,033; Jasani Colour Chem Inds., 500 Kgs., Rs. 49,033; Jay Chem Inds., 500 Kgs., Rs. 49,033; Jayesh Industries, 1,000 Kgs., Rs. 98,068; Khyati Chemicals Inds., 1,000 Kgs., Rs. 98,068; Krishnakant Chemicals Inds., 1,000 Kgs., Rs. 98,068; K.K. Industries, 500 Kgs., Rs. 49,033; Meghmani Dyes & Intermediates, 1,000 Kgs., Rs. 98,068; M.K. Soorenji & Co., 500 Kgs., Rs. 49,033; M.M. Inds., 1,000 Kgs., Rs. 98,068; Parekh & Company, 12,000 Kgs., Rs. 11,76,812; Poseidon Chem, 1,000 Kgs., Rs. 98,068; Raghunath Dye Chem, 1,000 Kgs., Rs. 98,068, Rangodadhi Chem Pvt. Ltd., 500 Kgs., Rs. 49,033; Shree Krishna Chemicals, 500 Kgs., Rs. 49,033; Snow Dye Chem, 1,000 Kgs., Rs. 98,068; Supernova Intermediates P. Ltd., 500 Kgs., Rs. 49,033; Supreme Chem, 1,000 Kgs., Rs. 98,068.

CYSTEAMINE HYDROCHLORIDE: From UK: Orchev Pharma P. Ltd., 2,500 Kgs., Rs. 9,27,551.

3-5 DICARBO METHOXY BENZENE SULPHATE: From Japan: Petrofils Co-operative Ltd., 10.08 Mts., Rs. 18,56,875.

DICARBOXYLIC ACID: From France: BASF India Ltd., 15 Mts., Rs. 5,00,236.

DIMETHYL FORMAMIDE: From Germany: Speciality Chemicals, 14.820 Kgs., Rs. 4,65,991.

DIMETHYL HEXANOIC ACID: From France: Aryavart Chemicals P. Ltd., 14.800 Mts., Rs. 5,45,273.

DIMETHYL UREA: From Germany: Bakul Aromatics & Chemicals, 25,000 Kgs., Rs. 11,92,194.

EPICHLOROHYDRIN 99% MIN: From Japan: Bharat Pulverising Mills Ltd., 15.840 Mts., Rs. 7,04,332.

ETHYLENE VINYL ACETATE: From Germany: The Swadeshi Mill Co. Ltd., 1,000 Kgs., Rs. 1,01,555.

EUGENOL CRUDE: From Indonesia: Clovex Aromatics, 3,000 Kgs., Rs. 2,99,020.

GUM ARABIC: From Nigeria: Radhe Sons, 39,300 Kgs., Rs. 3,76,599; Simla Chem Pvt. Ltd., 20,000 Kgs., Rs. 1,90,566.

GUM COPAL: From Indonesia: Shamlal & Sons, 9,709 Kgs., Rs. 80,900.

HEXA BROMIDE: From Germany: BASF India Ltd., 360 Kgs., Rs. 98,126.

2 HYDROXY ETHYL METHACRYLATE: From Japan: Creative Polymers Pvt. Ltd., 600 Kgs., Rs. 62,153.

8-HYDROXYQUINOLINE: From France: Eskay Fine Chemicals, 1,500 Kgs., Rs. 7,14,622.

LABORATORY CHEMICALS: From UK: Tolani Chemicals, 264 Nos. Rs. 1,73,636.

LAURYL ALCOHOL: From USA: Hico Products Ltd., 13,291 Kgs., Rs. 5,38,182.

LIGNIN: From Japan: Chika International, 3,000 Kgs., Rs. 1,06,471.

METHACRYLAMIDE: From Japan: BASF India Ltd., 2,000 Kgs., Rs. 3,01,729.

NAPHTHALENE CRUDE: From Egypt: The Malwa Vanaspati & Chemicals Ltd., 46.9965 Mts., Rs. 6,56,769.

N-N DIMETHYL COCONUT AMINE: From Philippines: Flame Pharmaceuticals Pvt. Ltd., 4,960 Kgs., Rs. 3,86,634.

PARAFORMALDEHYDE PRILLS: From Spain: Henkel Chem India Ltd., 20 Mts., Rs. 2,73,294.

PARA OCTYL PHENOL: From Japan: Bakelite Hylam Ltd., 14,000 Kgs., Rs. 5,65,017.

PARA TERTIARY BUTYL PHENOL: From Korea: Hardcastle & Waud Mfg. Co. Ltd., 12 Mts. Rs. 5,33,584.

PERCHLOROETHYLENE: From Germany: D. Jamnadas & Co., 20,088 Kgs., Rs. 2,48,975.

POLYACETAL RESIN: From Japan: Gujarat Petrosynthese Ltd., 17 Mts., Rs. 8,90,908; K. Raheja Mercantile Corpn., 17 Mts., Rs. 8,90,896.

POLYVINYL ALCOHOL: From Japan: Yogiware Fabrics P. Ltd., 1,000 Kgs., Rs. 51,222.

PROPYLENE GLYCOL USP: From USA: The General Import & Co., 16,770 Kgs., Rs. 4,95,980.

SODIUM ALGINATE: From Norway: Dental Products of India Ltd., 500 Kgs., Rs. 2,32,649.

THIOGLYCOLIC ACID 80%: From Japan: Cibatul Ltd., 6,125 Kgs., Rs. 6,18,625.

TITANIUM DIOXIDE: From Australia: Perfect Colourants & Plastics, 20 Mts., Rs. 10,16,352; From USA: Indian Trading Corpn., 16,000 Kgs., Rs. 8,19,433.

TOLUENE DI-ISOCYANATE: From Germany: Goodlass Nerolac Paints Ltd., 1,000 Kgs., Rs. 79,403; From Japan: Sikane, 8,000 Kgs., Rs. 5,25,182; From USA: Wadhwa Poly Foam P. Ltd., 16,000 Kgs., Rs. 10,41,761.

TRIMELLITIC ANHYDRIDE: From USA: Dr. Beck & Co. (I) Ltd., 16,000 Kgs., Rs. 13,16,176.

TRIMETHYL HEXAMETHYLENE DIAMINE: From Germany: Cibatul Limited, 2,160 Kgs., Rs. 6,83,243.

TURPENTINE OIL: From Indonesia: Camphor & Allied Products Ltd., 136 Mts., Rs. 23,08,829.

DRUG MATERIALS IMPORTED BOMBAY (28.4.92)

D MANNITOL: From China: Unique Traders, 7,500 Kgs., Rs. 6,92,064.

MANNITOL BP/USP: From Brazil: Mafatlal Inds. Ltd., 12,000 Kgs., Rs. 14,42,896.

D MANNITOL USP 21/BP 80 PYROGEN FREE: From China: Unique Traders, 5,000 Kgs., Rs. 4,61,376.

LACTOSE BP 88 USP 22 200 MESH POWDER: From Netherlands: Cadila Laboratories Ltd., 10 Mts., Rs. 3,32,826.

L-LYSINE MONO HCl USP: From Japan: Natvarlal and Co., 500 Kgs., Rs. 73,939.

L-LYSINE MONO HCl: From Thailand: Bombay Pharma Products, 2,500 Kgs., Rs. 1,83,367; United Chem, 2,000 Kgs., Rs. 1,47,877.

MORPHOLINE: From USA: Polyolefins Industries Ltd., 30.240 Mts., Rs. 19,01,697.

PECTIN USP: From UK: Abbott Laboratories (India) Ltd., 500 Kgs., Rs. 2,39,665.

SULPHADIAZINE BP 88: From China: Mafatlal Inds. Ltd., 2,000 Kgs., Rs. 6,03,459.

PLASTIC MATERIALS IMPORTED BOMBAY (28.4.92)

EPOXY RESIN: From Japan: Peico Electronics & Electricals Ltd., 1,350 Kgs., Rs. 4,56,183.

HDPE: From Japan: Narmada Extrusions P. Ltd., 33 Mts., Rs. 6,52,612; From Korea: Apurva Inds., 16 Mts., Rs. 3,83,279; Arm Polymers Ltd., 32 Mts., Rs. 7,38,419; Associated Plastic Inds., 16 Mts., Rs. 3,51,478; Chetan Inds., 32 Mts., Rs. 6,94,088; Dynamic Packagings, 16 Mts., Rs. 3,82,976; Jayantilal Mangaldas & Sons, 16 Mts., Rs. 3,56,244; Mahalchandmotilal Kothari and Co., 8 Mts., Rs. 1,63,785; Prince Marketing, 32 Mts., Rs. 7,04,672; Shyam Textile P. Ltd., 16 Mts., Rs. 3,62,046; Sona Overseas, 48 Mts., Rs. 10,87,444; Sun Export Corpn., 16 Mts., Rs. 3,51,652; From Saudi Arabia: Moonaplastic Inds., 17.150 Mts., Rs. 4,03,079; Unilite Inds., 34.300 Mts., Rs. 7,35,466; From Singapore: Niranjan Plastics, 17 Mts., Rs. 4,06,090; From USA: Adarsh Packers P. Ltd., 17.500 Mts., Rs. 3,61,281; Associated Plastic Inds., 16.500 Mts., Rs. 3,40,636; Manish International, 17.750 Mts., Rs. 3,79,552.

HDPE: From USA: Overseas Trading Corporation, 34,000 Kgs., Rs. 6,93,434; Shah Monofilament Plastic Inds., 16.783 Mts., Rs. 3,62,471; Subhash Corpn., 35 Mts., Rs. 7,05,890; Tirupati Fibre Inds., 16.500 Mts., Rs. 3,26,954; Tirupati International, 16.5 Mts., Rs. 2,74,045; Union Polymer, 30 Mts., Rs. 6,94,772; Urvakunj Intl., 35 Mts., Rs. 7,22,562; From Yugoslavia: Associated Plastic Inds., 15 Mts., Rs. 3,72,708.

LDPE: From Canada: D.S. Mehta and Co., 25 Mts., Rs. 4,28,774; Manav International, 25 Mts., Rs. 4,60,535; From Japan: Universal Cables Ltd., 500 Kgs., Rs. 33,515; From Yugoslavia: Jai Fibres Ltd., 30 Mts., Rs. 7,07,122; Shah Patel & Co., 30 Mts., Rs. 7,07,148; Shriram Chemicals, 45 Mts., Rs. 10,75,655.

LLDPE: From Saudi Arabia: Gujarat Metal Cast P. Ltd., 49.500 Mts., Rs. 11,24,100; From USA: Anand Polyrotex, 2 Mts., Rs. 2,14,704.

POLYPROPYLENE: From Brazil: A-1 Art, 13 Mts., Rs. 2,73,214; Premier Polymers, 16 Mts., Rs. 2,13,598; Shri Hanuman Overseas Corpn., 9 Mts., Rs. 1,81,850; From Hungary: Kalpesh Plastic Inds., 15 Mts., Rs. 3,14,978; From Japan: M.P. United Polypropylene Ltd., 15 Mts., Rs. 6,90,801; From Korea: Jhaveri Polymers P. Ltd., 48 Mts., Rs. 9,61,874; From Yugoslavia: Eagle Flask Inds. Ltd., 31 Mts., Rs. 6,67,516; R.D. Plastics Inds., 31 Mts., Rs. 7,51,148; From Hong Kong: Medi Pharma Drug House, 51 Mts., Rs. 12,14,859.

POLYSTYRENE: From Korea: Steels P. Ltd., 17 Mts., Rs. 3,79,085; Tainwala Chem & Plastics I Ltd., 17 Mts., Rs. 3,58,240; Tolaram Ele. P. Ltd., 17 Mts., Rs. 5,19,165.

PVC RESIN: From Korea: Jalgaon Pipes Mfg. Co. Ltd., 96 Mts., Rs. 17,42,401.

MATERIALS IMPORTED BOMBAY (29.4.92)

ACRYLIC ACID: From Japan: Texto Chemicals, 8,000 Kgs., Rs. 2,60,264.

ALLYL ALCOHOL: From Germany: Cadila Chemicals Ltd., 170 Kgs., Rs. 46,068.

AMINO ETHYL ETHANOLAMINE: From Sweden: Navdeep Chemicals P. Ltd., 3,200 Kgs., Rs. 3,04,986.

2-AMINO-1-HYDROXY-5-NITRO

BENZENE: From Japan: Sandoz India Ltd., 150 Kgs., Rs. 1,72,117.

2-AMINO-6-PICOLINE: From Switzerland: Ranbaxy Laboratories Ltd., 2,000 Kgs., Rs. 8,73,428.

ARSENIC TRIOXIDE: From Philippines: K.T. Corporation, 40.500 Mts., Rs. 4,79,154.

BACTERIAL ALPHA AMILASE: From Germany: Maize Products, 2,520 Kgs., Rs. 5,35,597.

BISPHENOL-A: From Korea: Sebro Art Printers, 6,000 Kgs., Rs. 2,00,094.

BUTYL ACRYLATE: From Japan: Pidilite Inds. Ltd., 28,800 Kgs., Rs. 9,67,771; Texto Chemicals, 7,200 Kgs., Rs. 2,28,913.

CAPROLACTUM: From Bulgaria: Modipon Ltd., 1,35,000 Kgs., Rs. 60,21,637.

CELLULOSE ACETATE SYNTHETIC RESIN: From USA: Gauri Turnkey Projects P. Ltd., 19.646 Mts., Rs. 1,74,713.

CETYL ALCOHOL C-16: From Germany: Paras Trading Co., 2,000 Kgs., Rs. 1,02,018.

CYANO 4 NITRO ANILINE: From China: Jaysynth Dye Chem Ltd., 3,000 Kgs., Rs. 9,05,188.

2 CYANOPYRAZINE: From Japan: Calxy Chemicals, 1,000 Kgs., Rs. 9,10,922.

CYCLOHEXANONE: From Italy: R.K.G. Petrochem Products, 86,640 Kgs., Rs. 26,96,738.

DANE SALT: From Singapore: Lupin Laboratories Ltd., 1,500 Kgs., Rs. 8,86,132.

DEHYDROPREGNENOLONE ACETATE: From China: Kantilal Manilal & Co. Pvt. Ltd., 500 Kgs., Rs. 13,49,843.

DIETHYL METHYL MALONATE: From Switzerland: FDC Ltd., 1,600 Kgs., Rs. 9,19,877.

GAMMA PICOLINE: From Switzerland: Kwizol Chem P. Ltd., 5,040 Kgs., Rs. 4,96,234.

HEXAFLUOROPHOSPHORIC ACID: From USA: Technova Platemaking Systems, 10 Nos., Rs. 39,224.

HYDROXY ETHYL CELLULOSE: From USA: Pidilite Inds. Ltd., 1,996 Kgs., Rs. 3,32,797.

IODINE CRUDE: From China: Lub-Chem, 950 Kgs., Rs. 2,83,827.

ISOBUTYRIC ACID: From Germany: Cadila Chemicals Ltd., 360 Kgs., Rs. 51,328.

LITHIUM CARBONATE: From USA: Chemical Corpn., 1,996 Kgs., Rs. 2,50,888.

L-METHIONINE: From Japan: Wockhardt Ltd., 100 Kgs., Rs. 1,07,892.

METHOCEL CELLULOSE: From Singapore: FDC Ltd., 90 Kgs., Rs. 54,631.

METHYL ACETO ACETATE: From USA: Cepham Organics Ltd., 14,724 Kgs., Rs. 7,48,238.

MICROCRYSTALLINE WAX: From Spain: Ya International, 11,000 Kgs., Rs. 2,89,543.

MONOMETHYL ACETOACETAMIDE 70%: From USA: Lupin Laboratories Ltd., 15,480 Kgs., Rs. 6,86,740.

NAPHTHALENE CRUDE 78.5%: From Canada: Bordia Chemicals P. Ltd., 93.6 Mts., Rs. 13,37,773.

1-4 NAPHTHOQUINOLONE: From Japan: P.G. Chemicals P. Ltd., 1,500 Kgs., Rs. 2,21,168.

PARAFORMALDEHYDE: From Spain: Roche Products Ltd., 5,000 Kgs., Rs. 75,417.

POLYETHYLENE WAX: From Japan: Sandoz (India) Ltd., 10 Mts., Rs. 5,08,176.

POLYTETRA FLUOROETHYLENE: From Japan: Mach Polymers, 1,100 Kgs., Rs. 3,66,840.

POLYVINYL ALCOHOL: From Japan: Rawalwasia Yarn Dyeing P. Ltd., 1.5 Mts., Rs. 92,901; Surat Sizing Industries, 1.5 Mts., Rs. 92,901.

POLYVINYL PYRROLIDONE: From Germany: Ethnor Ltd., 200 Kgs., Rs. 94,222.

PROPIONIC ACID: From Germany: Hindustan Lever Ltd., 6,510 Kgs., Rs. 2,27,441.

PROPIONIC ANHYDRIDE: From Japan: M. Champak & Co., 1,980 Kgs., Rs. 1,82,813.

SODIUM LAURYL SULPHATE: From France: Colgate Palmolive (India) Ltd., 44,000 Kgs., Rs. 26,17,416.

SODIUM METHALLYL SULPHONATE: From Japan: J.K. Synthetics, 4.5 Mts., Rs. 4,90,946.

TETRALENE: From Germany: Cadila Chemicals Ltd., 225 Kgs., Rs. 39,253.

THIOGLYCOLIC ACID 80%: From Germany: Kantilal Manilal & Co. P. Ltd., 1,500 Kgs., Rs. 1,49,986.

THIOGLYCOLIC ACID: From Germany: Lakme Ltd., 600 Kgs., Rs. 76,147.

THIOUREA: From Japan: Cadila Laboratories Ltd., 2,000 Kgs., Rs. 1,35,778.

TITANIUM DIOXIDE RUTILE: From Australia: C.J. Plastics P. Ltd., 20,000 Kgs., Rs. 9,46,413.

TITANIUM N PROPOXIDE: From UK: Indian Petrochemicals Corpn., 6,000 Kgs., Rs. 14,22,818.

TOLUENE DI ISOCYANATE: From USA: M.H. Polymers P. Ltd., 19,000 Kgs., Rs. 12,42,522.

TRI-N-BUTYLAMINE: From Germany: Niyati Corpn., 930 Kgs., Rs. 96,268.

VANILLIN USP: From Norway: Quest Intnl. India Ltd., 1,600 Kgs., Rs. 6,86,038.

PLASTIC MATERIALS IMPORTED BOMBAY (29.4.92)

ACETAL RESIN: From Singapore: Polyset Plastics Ltd., 14 Mts., Rs. 7,87,705.

HDPE: From Japan: Bonus Plastic P. Ltd., 32,000 Kgs., Rs. 7,42,673; From Korea: Annapurna Plastopacks P. Ltd., 48 Mts., Rs. 11,09,069; Bharath Overseas Corpn., 8 Mts., Rs. 1,75,725; Jayantilal Mangaldas & Sons, 16 Mts., Rs. 3,56,244; Kamdar Impex, 40 Mts., Rs. 8,42,540; K.L.J. Plastics Ltd., 32 Mts., Rs. 7,34,652; Krishna Filaments Ltd., 48 Mts., Rs. 11,40,843; Malwa Fastners P. Ltd., 32,000 Kgs., Rs. 7,04,363; Metro Dyechem India Ltd., 152 Mts., Rs. 32,07,087; Riviera Polymers P. Ltd., 16 Mts., Rs. 3,72,916.

HDPE: From S. Arabia: Hindustan Ciba Geigy Ltd., 51.450 Mts.,

Rs. 12,90,926; Jolly Plastics, 51.45 Mts., Rs. 12,01,066; Narendra Polyplast, 17.15 Mts., Rs. 4,19,420; Shailesh Engineering, 17.150 Mts., Rs. 4,19,421; Star Plastics, 17.15 Mts., Rs. 4,30,314; From Thailand: Shrifabs India P. Ltd., 17 Mts., Rs. 3,80,105; Yomika Fabrics P. Ltd., 17 Mts., Rs. 3,79,734; From USA: A-1 Plastics, 1,12,000 Kgs., Rs. 25,61,209; Associated Brothers, 16 Mts., Rs. 3,41,978; Ganapati Fishing Lines P. Ltd., 5.950 Mts., Rs. 1,02,944; Manish International, 17.750 Mts., Rs. 3,79,552; Neo Sack Ltd., 35 Mts., Rs. 7,00,230; Pooja Inds., 17 Mts., Rs. 3,65,394; Pushpha Impex P. Ltd., 52.500 Mts., Rs. 10,50,495; Rasiklal Mansuklal & Co., 17.5 Mts., Rs. 3,26,068; R.K. Trading Co., 17.500 Mts., Rs. 3,48,109; Shah Patel & Co., 16.500 Mts., Rs. 3,45,876; Southern Marketing Associates, 17 Mts., Rs. 3,65,856; From Yugoslavia: Associated Plastic Inds., 65 Mts., Rs. 16,15,068; Hindustan Ciba Geigy Ltd., 20 Mts., Rs. 4,95,472; Jyothi Impex, 10 Mts., Rs. 2,48,534; Kalpesh Plastic Inds., 27 Mts., Rs. 6,70,617; Marico Industries Ltd., 50 Mts., Rs. 12,42,229; Ponds India Ltd., 20 Mts., Rs. 4,97,173; Progressive Trading Co., 15 Mts., Rs. 3,72,768; R.K. Exports, 15 Mts., Rs. 3,72,705.

LDPE: From Yugoslavia: Associated Plastic Industries, 25 Mts., Rs. 5,97,360; Hitech Polymers, 30 Mts., Rs. 7,07,316; Raj Packagings Inds. P. Ltd., 25 Mts., Rs. 6,00,915; Shriram Chemicals, 4 Mts., Rs. 94,339.

LLDPE: From Netherlands: The Supreme Inds. Ltd., 60 Mts., Rs. 16,19,811.

POLYACETAL RESIN: From Korea: D.R. Polymers P. Ltd., 30,500 Kgs., Rs. 12,13,755.

POLYETHYLENE: From Thailand: Daniel Philips & Co. P. Ltd., 34 Mts., Rs. 7,59,486.

POLYPROPYLENE: From Brazil: Pan Asia Industries Ltd., 70 Mts., Rs. 14,02,639; From Japan: Videocon Appliances Ltd., 15.5 Mts., Rs. 4,12,597; From Korea: D.V. Polymers, 16 Mts., Rs. 3,32,650; Kothari Sales Agencies, 45 Mts., Rs. 9,75,200; Metro Dyechem India Ltd., 93 Mts., Rs. 18,88,812; Sidharth International, 15.5 Mts., Rs. 3,17,035; Swati Growth Funds Ltd., 16 Mts., Rs. 3,57,060; From Norway: Metro Dyechem India Ltd., 15,000 Kgs., Rs. 2,71,872; From Thailand: Diamond Polyplast P. Ltd., 16 Mts., Rs. 3,54,025; From Yugoslavia: Shailesh Engg. & Plastic Inds., 15.500 Mts., Rs. 3,75,058.

POLYSTYRENE: From Japan: Jayantilal Mangaldas & Sons, 34,000 Kgs., Rs. 7,57,016; Sigma India, 17 Mts., Rs. 2,51,948; From Korea: Gadia Chemicals P. Ltd., 51 Mts., Rs. 11,38,302; India Navigation Co., 17 Mts., Rs. 4,17,803; R.K. Exports, 17 Mts., Rs. 3,52,914; Texla Plastics & Metal P. Ltd., 17 Mts., Rs. 3,85,381; Tinna Overseas P. Ltd., 153 Mts., Rs. 35,13,264; Unilite Plastic Inds. P. Ltd., 51 Mts., Rs. 10,60,324.

POLYVINYL BUTYRAL RESIN: From USA: Atul Industries Ltd., 424.56 Kgs., Rs. 97,560.

PVC RESIN: From France: Caprihans India Ltd., 2,050 Kgs., Rs. 1,41,766; From Germany: Phiroze Sethna P. Ltd., 1 Mt. Rs. 1,27,103; From Greece: Novilex Polymers P. Ltd., 90 Mts., Rs. 13,77,026; From Korea: Dimple Overseas Ltd., 102 Mts., Rs. 17,55,210; Nikhil Footwears P. Ltd., 102 Mts., Rs. 17,55,567; From Mexico: Star Oxides & Chem Ltd., 101.975 Mts., Rs. 17,74,675; Tube Products, 83.28 Mts., Rs. 13,37,575.

MATERIALS IMPORTED BOMBAY (30.4.92)

ACETANILIDE: From Japan: Jindal Dye Intermediates P. Ltd., 48 Mts., Rs. 20,88,603; From Korea: Jindal Dye Intermediates P. Ltd., 34 Mts., Rs. 14,03,837; From Poland: Jay Chemical Inds., 34,000 Kgs., Rs. 12,12,000.

ACETIC ANHYDRIDE: From Germany: Dalal Enterprises, 16,000 Kgs., Rs. 4,73,206; From Singapore: Dinesh Chemicals P. Ltd., 18,000 Kgs., Rs. 5,19,048; From USA: Monarch Dyestuffs Inds., 16.45 Mts., Rs. 4,86,515; Regent Chemicals Ltd., 17,100 Kgs., Rs. 5,25,969; Triochem Products Ltd., 67,200 Kgs., Rs. 19,37,780.

ACETO ACETIC ESTER METHYL: From Japan: Jeevan Products, 1,200 Kgs., Rs. 67,559.

ACETYLENE: From USA: National Physical Laboratory, 3 Kgs., Rs. 87,173.

ACRYLAMIDE: From Japan: Highland Dye Works, 465 Kgs., Rs. 16,489.

ACRYLIC ACID: From Japan: Pidilite Inds. Ltd., 600 Kgs., Rs. 26,618.

ADIPIC ACID: From Japan: Speciality Chemicals, 8,500 Kgs., Rs. 3,02,365.

ALLYL DIGLYCOL CARBONATE: From UK: Forbes Campbell & Co., Ltd., 11,250 Kgs., Rs. 18,78,099.

ALUMINIUM TRIHYDRATE: From Germany: Radini Cables Ltd., 8,600 Kgs., Rs. 2,89,406.

AMINOBUTANOL: From Germany: Lupin Labs Ltd., 15,210 Kgs., Rs. 42,98,908.

AMMONIA ANHYDROUS: From Saudi Arabia: Rashtriya Chemicals & Fertilisers Ltd., 3,000 Mts., Rs. 1,18,41,137; From UAE: Rashtriya Chemicals & Fertilisers Ltd., 7,000 Mts., Rs. 3,31,85,702.

ANILINE OIL: From Bulgaria: Marvel Drugs (P) Ltd., 1,200 Kgs., Rs. 27,032; From Japan: Aagar Drugs & Pharmls., 80 Mts., Rs. 22,10,118; Caffil P. Ltd., 28 Mts., Rs. 6,69,306; Hindustan Chemicals Inds., 30,800 Kgs., Rs. 7,44,327; International Dyestuff Inds., 46,000 Kgs., Rs. 11,11,657; From Japan: Jaysynth Dyechem Ltd., 31,000 Kgs., Rs. 8,66,411; Liberty Exports Ltd., 16,600 Kgs., Rs. 4,05,523; Sagar Drugs & Pharmaceuticals, 128 Mts., Rs. 33,08,918.

AROMATIC CHEMICALS: From China: Continental Chemicals Ltd., 4.500 Mts., Rs, 3,35,873; From Germany: Godrej Soaps Ltd., 529 Kgs., Rs. 7,01,445; From Germany: Godrej Soaps Ltd., 1,000 Kgs., Rs. 2,44,208; Jindal Dye Intermediates P. Ltd., 340 Kgs., Rs. 2,95,645; Jindal Dye Intermediates P. Ltd., 360 Kgs., Rs. 4,26,402; From UK: Godrej Soaps Ltd., 3,000 Kgs., Rs. 13,77,278.

ATRAZINE TECH: From Isreal: Northern Minerals Ltd., 10,990 Kgs., Rs. 14,13,667.

BENZALDEHYDE: From Singapore: Silvassa Syndet P. Ltd., 1,200 Kgs., Rs. 3,05,218; From USA: Ravi Dye Chem., 16.8 Mts., Rs. 6,84,016.

BETA PICOLINE: From Belgium: Galxo India Ltd., 14,440 Kgs., Rs. 15,22,783; Khojchem P. Ltd., 14,440 Kgs., Rs. 13,37,578; Manjarati Chemicals, 5,130 Kgs., Rs. 5,73,508; Pharma India Labs., 14.440 Mts., Rs. 16,73,996; Rofa Laboratories P. Ltd., 18,430 Kgs., Rs. 20,31,050; Rupal Chemicals Inds. P. Ltd., 28,880 Kgs., Rs. 30,91,084.

2-BETENE 1: From USA: Excel Industries Ltd., 24,346 Kgs., Rs. 33,40,589.

BIS METHYL SILYL UREA: From Germany: Max India Ltd., 16,000 Kgs., Rs. 54,11,792.

BROMINE LIQUID: From Netherlands: Nit Pharma & Chemicals, 22,680 Kgs., Rs. 9,97,890.

BROMO CHLOROPROPANE: From Germany: Hoechst India Ltd., 1,500 Kgs., Rs. 2,44,019.

2 BUTENE 1-4 DIOL (BUTENE DIOL): From Germany: Bharat Pulverising Mills Ltd., 16,000 Kgs., Rs. 20,53,270.

CALCINED PETROLEUM COKE: From UK: H.E.G. Ltd., 54 Mts., Rs. 9,28,379.

CAPROLACTAM: From Netherlands: Nihal Cast Nylon P. Ltd., 1,050 Kgs., Rs. 51,025.

CARBON BLACK: From Korea: Kohinoor India P. Ltd., 21 Mts., Rs. 3,54,017; Navyug India Ltd., 88,000 Kgs., Rs. 14,63,906; From Thailand: A.V. Industries, 20,700 Kgs., Rs. 3,36,714; Ceat Ltd., 276 Mts., Rs. 64,38,649.

CARBON TETRA CHLORIDE: From Germany: SRF Ltd., 181.17 Mts., Rs. 17,83,784.

CARNAUBA WAX: From Brazil: Pharma Chem Associates, 7,000 Kgs., Rs. 2,29,775.

CAUSTIC POTASH: From France: Jindal Dye Intermediate Ltd., 1,08,000 Kgs., Rs. 18,44,005.

CETYL ALCOHOL: From Japan: Unique Pharmaceutical Labs., 2,240 Kgs., Rs. 2,77,464.

3 CHLORO 4 FLUORO ANILINE: From China: Plant Organics Ltd., 3,000 Kgs., Rs. 15,70,454; Wockhardt Ltd., 2,000 Kgs., Rs. 11,43,396.

CHLOROQUINE PHOSPHATE: From China: Rhone Poulenc (India) Ltd., 3,625 Kgs., Rs. 27,28,667.

CITRIC ACID: From China: G. Amphray Labs., 120 Mts., Rs. 35,54,001; From Hong Kong: Mehta Pharmls. Inds., 1.709 Mts., Rs. 43,994.

COBALT OCTOATE NUODEX: From Netherlands: U.K. Paint Industries, 7 Mts., Rs. 16,87,277.

2 CYANO 4 NITRO ANILINE 96%: From China: Indian Dyestuff Inds. Ltd., 1 mt., Rs. 2,80,132.

CYANURIC CHLORIDE: From Belgium: Eskay Chemical Corpn., 1,000 Kgs., Rs. 90,329; United Chemie, 1,000 Kgs., Rs. 98,068; From Germany: Ind. Expo Trading Co., 3,350 Kgs., Rs. 3,11,126; Jaysynth Dyechem Ltd., 18 Mts., Rs. 17,00,838.

CYCLOHEXANONE: From USA: Asmaco Plastic Inds., 30.108 Mts., Rs. 9,00,625.

4,4 DIAMINO BENZANILIDE: From Japan: Atul Products Ltd., 4,600 Kgs., Rs. 21,44,772.

DIAMINO DIPHENYL/METHANE: From Japan: Intec Polymers P. Ltd., 1 Mt., Rs. 1,17,912.

DICHLORO BENZYL CHLORIDE: From Japan: FDC P. Ltd., 750 Kgs., Rs. 2,43,997.

DICHLORO NAPHTHOQUINONE: From Japan: Toshniwal Exports, 1,400 Kgs., Rs. 4,50,212.

2,4, DICHLORO TOLUENE (PURE): From Germany: Ariane Orgochem P. Ltd., 1,680 Kgs., Rs. 3,71,503.

DICUMYL PEROXIDE 99%: From China: High Polymer Labs., 5,740 Kgs., Rs. 6,56,309.

DIETHANOLAMINE: From Germany: Ravi Chem Dye, 14,850 Kgs., Rs. 4,33,919; From Japan: Diamond Dyechem (B) P. Ltd., 6,720 Kgs., Rs. 1,80,933; Eskay Chemical Corpn., 2,100 Kgs., Rs. 51,852; Meghdoot Plastic Corpn., 3,780 Kgs., Rs. 99,292.

DIETHYLENE DIAMINE: From Sweden: Industrial Trading Co., 3,040 Kgs., Rs. 3,12,985.

DIHYDROMYRCENOL: From Netherlands: Vikshara Trading & Investments, 1,000 Kgs., Rs. 2,24,772.

DIMETHYL ANILINE: From Japan: Ravi Chem Dye, 10,530 Kgs., Rs. 4,14,901.

DIMETHYL FORMAMIDE: From Japan: Tender Remedies P. Ltd., 16,340 Kgs., Rs. 7,37,942.

DIMETHYL PHOSPHORO CHLORIDOTHIOATE: From Denmark: Bayer India Ltd., 19,388 Kgs., Rs. 14,02,173.

CHEMICAL WEEKLY

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Power shortage — Natural Gas to the rescue(?)

THE energy shortage in the country is of the order of 7.9 per cent, with a peaking shortage of 16.7 per cent. By the end of 1994-95, the corresponding figures will be 2.7 per cent and 16.6 per cent. In other words, the peaking shortage is expected to remain at the same level even after the revised plan of addition to the generating capacity to the tune of 28,000 MW. Of the total generation of 264 billion units, thermal power — coal oil and gas based — accounts for a major share of 186.5 billion units.

The power sector has been opened up for the private sector. As many as 53 power projects with a total generating capacity of 21,558 MW have been offered to the private sector. Of these, 30 projects totalling 19,515 MW of capacity are thermal units, which include nine gas based projects with a total of 5,260 MW capacity.

In other words, nearly a third of the thermal power projects offered to the private sector is gas-based. If one takes into account the gas-based units already commissioned, under construction and on the drawing boards of the public sector National Thermal Power Corporation (NTPC) it will be clear that the gas-based power projects are poised to make a significant contribution to achieving the aims of the energy policy.

Gas-based power plants in Eighth Plan

During the Eighth Five Year Plan period, a total capacity addition of about 7485 MW is envisaged from the gas based power projects. The details of the various gas based power projects expected to yield benefits during the Eighth Plan period are given in Table on p. 52.

Though gas-based power units of small capacity had come up more than a decade ago — in Uran (Maharashtra), Assam and Delhi it was the construction of the Hazira-Bijaipur-Jagdishpur (HBJ) network that gave a fillip to the establishment of higher capacity combined-cycle gas-based units.

For instance, tne thermal efficiency of a gas-based unit is around 50 per cent as compared to 30 per cent for a coal-based unit.

Another advantage lies in the shorter gestation period. As compared to 48 to 60 months for a coal-based unit, the gestation period for a gas-based unit is between 17 and 23 months. The investment required for putting up a gas-based unit is only 70 per cent of that for a coal-based unit. But the production cost per unit is higher for gas-based power than for coal-based power, in view of the fact that gas price is higher than coal price at the pithead. The coal-based unit however ceases to have this advantage, if it is located far away from the pithead and the coal cost includes freight.

All these have made the NTPC take up gas-based units in a big way and be in the forefront in using the combined cycle technology. In most foreign countries the gas-based project has only the gas turbine without any steam turbine attached to it. In that case, the exhaust heat is allowed to go waste. But, in the combined-cycle system where the gas turbine is supplemented by a steam turbine the heat of the exhaust gas is also utilised.

The NTPC has gone in for the combined cycle system and has already commissioned two-projects one at Anta (Rajasthan) and the other at Auraiya (Utttar Pradesh) and is erecting two other projects one at Kawas (Gujarat) and the other at Dadri (National Capital Region near Delhi). Together, these four projects have a capacity of 2,526 MW. The respective share of Anta, Auraiya, Kawas and Dadri are: 413 MW, 652 MW, 644 MW and 817 MW. Thus, the Dadri unit is the largest of the present family of gas-based units under the NTPC.

The Kawas project is expected to be fully ready for commissioning by 1993-94 and Dadri by 1992-93. The Anta project has three gas turbines of 88 MW each and one steam turbine of 149 MW. The Auraiya station has four gas turbines of 112 MW each and two steam turbines of 102 MW each. The Kawas plant has four gas

GAS BASED POWER PLANTS IN EIGHTH PLAN

Sr. No.	Name of the Project	State	Installed Capacity (MW)	Benefits during the 8th Plan (MW)
1. Central Sector				
1.	Kawas Gas-based power project (GPP)	Gujarat	4x100 + 2x100	600
2.	Kathalguri GPP	Assam	6x30 + 3x30	270
3.	Dadri GPP	U.P.	4x131.3 + 2x146.5	817.2
4.	Anta GPP Extn.	U.P.	3x100 + 3x10	430
5.	Gandhar GPP	Gujarat	650	650
6.	Godavari GPP	Andhra Pradesh	800	800
7.	Rokhia GPP	Tripura	10x8	80
8.	Faridabad GPP	Haryana	4x130 + 2x140	800
9.	Tripura GPP	Tripura	500	500
	Sub-Total			4947.2
II. State Sector				
1.	Uran Waste Heat (W.H.)	Maharashtra	3x120	360
2.	Vijjeshwaram GPP (Unit-3)	Andhra Pradesh	3x33 + 1x33	33
3.	Lakwa Phase - II	Assam	3 x 20	60
4.	Lakwa W.H.	Assam	1 x 22	22
5.	Ramgarh	Rajasthan	1x3	3
6.	Vatwa GPP	Gujarat	2x33.5 + 1x35	102
7.	Utran GPP	Gujarat	3x30 + 1x45	135
8.	Gandhar GPP	Gujarat	600	600
9.	Pipavav GPP	Gujarat	750	750
10.	Karaikal GPP	Pondicherry	3x5 + 1x7.5	22.5
11.	Amguri GPP	Assam	8x30 + 4x30	360
12.	DESU W.H.	Delhi	3x30	90
	Sub-Total			2537.5
	Grand-Total (I + II)			7484.7

turbines of 106 MW each and two steam turbines of 110 MW each. The Dadri station has four gas turbines of 141 MW each and two steam turbines of 146.5 MW each.

New Projects

Encouraged by its experience with gas-based units during the last seven years, the NTPC has proposed a number of new projects besides expanding the capacity of Anta by 430 MW, Dadri by 408 MW, Kawas by 650 MW and Auraiya by 652 MW. The projects proposed are: 1,400 MW capacity in two stages at Gandhar (Gujarat); 800 MW capacity at Faridabad (Haryana); 430 MW in Kakinada (Andhra Pradesh); 800 MW in Tripura and 800 MW in Assam. On completion, all these will add over 5,000 MW of capacity before the end of the Eighth Plan.

Availability of gas crucial

But, the big question mark is whether adequate gas will be available for all of them. It is gathered from the Minister of Petroleum and Natural Gas that the prospects are not too bright. It was earlier envisaged that gas production would be around 98 million cubic metres a day by 1994-95. But the slippages in the activities of the ONGC have resulted in a downward revision of this projection. The revised estimate is that only 80 million cubic metres of gas will be produced daily by 1994-95. This has upset all the calculations worked out earlier.

With the downward revision in the estimate, there has been an over-commitment of gas. "We are in no position to make any further allocation unless there are cancellations of allocation already committed," says the official concerned in the Ministry of Petroleum and Natural Gas.

The problem will, of course, arise in respect of units on the HBJ grid, as much depends on the success in increasing the capacity of this grid and availability for all users. But the projects in Gandhar, Assam and Tri-

pura, the last two particularly, do not have any disability in this regard. The accent has to be on avoidance of flaring of gas and exploitation of the reserves in the new areas of the western region.

Change in basis of gas need

The Department of power had sought allocation of gas on the basis of "variable load." The allocation for the projects already approved and the commitments for some of those in the pipeline were made on this basis. But the department has now worked out the requirement on the basis of "base load" which implies larger quantities of gas. The Petroleum Ministry is not certain whether it will be able to find this additional quantities, though it shares the view that working out the gas requirement on the basis of "base load" operation is most economical.

When the technology is available, indigenous manufacture of equipment is possible and the necessary expertise has been built up in the NTPC to set up gas based units of higher capacity, there is no reason why this should not get a fillip. The constraint, if any, relates to gas availability. Even if gas is available at the source, the pipeline capacity has to be augmented. Already, proposals for augmenting the HBJ pipeline capacity have been initiated and the future of the gas based power units depends to a larger extent on these proposals fructifying.

Besides this, there is also the problem of competing demands on gas from different sectors. The fertilizer industry has been demanding priority in gas allocation on the plea that power can be generated on coal, which is abundantly available, whereas fertilizers have to depend upon naphtha or gas. But the power sector has been arguing that the fertilizer plants have not come up as envisaged on the HBJ pipeline and as such the gas committed to the unimplemented fertilizer projects should be allocated to the power sector.

So far as the gas allocation policy is concerned, the first priority is for the power sector. In cact, 45 per cent of the gas available is for allocation to the power sector. Next comes the fertilizer sector, followed by the sponge iron units and finally ther miscellaneous requirements. Thus, from the policy angle, the power sector has nothing to worry about getting gas. But, the problem arises from the actual availability and one hopes that this gets sorted out soon so that the gas based units which are more environment-friendly and have shorter gestation periods are encouraged to meet the growing demand for power. — **T.P.S. RAJAN**

(Source: *ASSOCHAM Parliament Digest* and *The Hindu Annual Survey*, 1992).

CHEMARENA

S.L. VENKITESWARAN

Global Warming

The "Earth Summit" in Rio de Janeiro draws nearer and there is apparently little prospect of an agreed formula to tackle global warming in the next few decades before the situation gets worse. It is appropriate that *Chemical and Engineering News,* the official journal of the American Chemical Society, has commented editorially. Chemistry is central to understanding the role of "greenhouse gases" and in the means to meet the situation. The basic agreed facts are:

1. The world has warmed by 0.3 to 0.6°C over the past century while over the past 10,000 years the change was nearer more than 1°C up or down.
2. Carbon dioxide is the major contributor for the warming and concentration has risen from 280 ppm to over 356 ppm in the century.
3. The bulk of the above increase has been due to human activity, mainly burning of fossil fuels even if .... there may not be a specific cause and effect relationship.

Other activities may also contribute but the main source has to be curtailed in countries which emit the maximum. There is need to get human society to move towards a sustainable economy built on efficient and environmentally friendly use of resources with no discrimination against the less developed countries seeking to move higher on the economic front.

In another analysis of the issues, US environmental groups have urged US government to change its CO_2 emission policy. All the industrialised countries except US, Turkey and Saudi Arabia (a strange group) seem to have settled on a policy to stabilise CO_2 emission to the 1990 levels to be achieved by AD 2000. This attitude seems to have blocked efforts to work out an agreed global formula on cuts in CO_2 levels. Obviously developing countries cannot agree to a 1990 level as there has to be higher growth rates for some years resulting in their rise in CO_2 emission levels. US is afraid that her economy will be hurt by a cut in CO_2 emissions, and energy efficient use of fuels is already at a high level.

An international alliance of legislators from European Parliament, Japanese Diet, US Congress and the new Commonwealth of Independent States has urged US to change its policy on 1990 levels. Global Legislatures Organisation for a Balanced Environment — GLOBE — an excellent appropriate acronym — has also urged for change by US. The Democratic Presidential candidates are reported to have accepted stabilisation of CO_2 emission levels by AD 2000 but are silent on the levels. Apparently there is need for a softer attitude by USA instead of pointing fingers at the developing countries which have no escape from a higher level of fossil fuel usage.

Methane to fuels

Direct conversion of methane to fuels continues to be the focus of much research, particularly on catalyst development. Methane is the base for methanol and hydrogen but beyond this it is indirect processing to chemicals or fuels. The direct conversion is a "catalytic assault" on the kinetic barriers that appear to limit the direct conversion to about 25%. Synthesis gas and methanol are intermediates which offer workable ways to fuels and olefines. Methanol can be directly used as fuel but not efficiently in relation to the original fuel value of methane. Till a direct catalytic conversion of high efficiency is developed there are limitations for wider fuel use of this relatively more abundant resource. Direct conversion to ethylene opens the gateway to petrochemicals but competitiveness is low.

Argonne National Laboratory of USA have focussed on use of oxygen instead of air at high temperatures but high oxygenated fuel components are not desirable. A catalyst based on sulfided molybdenum dispersed inside zeolite — type Y zeolite — has provided a reducing atmosphere for better yields. 9.7% molybdenum and sulphur to metal of 1.85 provided a structure for CH_3 ions to join up but there are other co-products and by-products as well — but temperatures are low at 350°C for oxidative addition.

CSIRO Laboratories in Australia have focussed on activation of reactants by metal oxide catalysts but have yet to succeed in higher conversion rates beyond 25% per pass. Additives to suppress undesirable reactions could help raise yields and selectivity. The conversion barrier in direct oxidative coupling seems to be a more limiting factor than the synthesis gas route which forms about 70% of the total cost of production of liquid fuels.

Mobil researchers, the originators of the MTG process, have developed an HZSM-5 zeolite to effect in situ conversion of the methanol to gasoline range hydrocarbons to replace the two stage process with independent plants. High pressure and temperature variations of the reactions — 5 atm. and 700°C — seems to give higher yields but is not advantageous.

There are also attempts to improve and modify the steam reforming process to take it above the 78% equilibrium maximum by removal of hydrogen through a semipermeable ceramic membrane from the reaction zone. But in spite of many innovations we are yet to reach a commercially acceptable direct oxidative coupling route to liquid hydrocarbons from methane.

Silicone gel breast implants

After nearly thirty years of silicone gel breast implants serious doubts about safety of these have arisen on the biological, physiological and chemical reactions. The original material is from Dow Corning while the implants are made by others. The lack of detailed knowledge of the possible effects has led to all types of claims when the implant ruptures in a small percentage of cases linking various diseases in the women to this non-biomaterial. Dow Corning have borne the brunt of the claims with the implant makers also obliged to pay compensation. There is an allegation that adequate tests were not carried out on bio-safety on humans before approval of marketing these.

Now a systematic study has been taken up on all aspects of its production and use and meanwhile the implant sale will be restricted severely and only under conditions that the users form part of the study.

Dow Chemical is particularly sensitive on these matters, more so after their larger stake in the drug industry through takeovers and certainly would like to avoid a stigma even if they can afford to pay the claims. A recent case is of an anti-nausea drug 'Benedictine' on which claims were paid off, drug withdrawn even though there was no clear evidence against the use of the drug. Presently a reported 200 claims on implants are there even though there are no supporting evidence on cause and effect. Now, although late, serious systematic reactions of the undetermined etiology that occurs in stray cases. The base molecule is said to be octamethyl cyclotetrasiloxane as the building block for the silicone shell gel and fluid.

In spite of the strict regimen for drug approvals problems crop up on safety and effective safeguards by the producers have to be on hand.

Dithiocarbamate fungicides — U.S. lifts ban

Maneb and zineb, the widely used fungicides on fruit and vegetable crops are ethylene bis-dithiocarbamate salts of manganese and zinc and other metals (EBDC's). There was much concern a few years back over residuals of these on fruit and vegetables leading to sickness and the possibility of cancer from the degradation products of these — ethylene thiourea. The residue may have been due to late application or excessive doses.

Even though the risk was very low the reaction of people at large forced U.S. Government to ban use of EBDC's on a number of fruits and vegetable crops. Four U.S. producers of these — Rohm & Haas, Du Pont, BASF and Elf Atochem — voluntarily withdrew the use on 42 items and launched an extensive review of the problems with extensive testing of samples from stores and producers of the fruits and vegetables. It was shown that these residues are very small and get easily removed on washing and there was no risk. The data provided by them has convinced EPA and led to their reversal of ban except for 11 crops which include apricots, carrots, peaches and spinach.

There is now a renewed life of these pesticides, although there are still some dissenting voices. In India, Indofil Chemicals, a subsidiary of Rohm & Haas, is the main producer and did not have to face any precipitate ban on their use.

Plea to step up power alcohol output

India should step up production of power-alcohol to reduce 20 per cent of its petrol consumption, thereby saving considerable amount of foreign exchange on import of petroleum products, says a sugarcane expert.

The new auto-fuel, gasohol — a blend of gasoline and ethanol, in the ratio of 80:20 would not only be cheaper but would also check pollution, Indian Sugarcane Development Council chairman **Dr. Krishan Bir Chaudhary** told UNI.

He said Brazil, the world's largest sugarcane growing country, was already producing power-alcohol successfully. India, which ranked second after Brazil in the production of sugarcane, could also follow suit, he added.

Dr. Chaudhary said he had sought from Brazil the technological knowhow for the production of power-alcohol, popularly known as 'proalcool' in that country, and they were keen to supply information to India. The Brazilian authorities had already supplied to India the preliminary information about the technology, he said.

Sugarcane in Brazil is largely grown as a source of alcohol and more than a million motor vehicles run on this fuel. Dr. Chaudhary, a power-alcohol expert besides being an authority on sugarcane production, said experiments had revealed that power-alcohol-run vehicled caused less air pollution compared to vehicles consuming pure petrol.

Toxicity of fumes exhausted by alcohol and gasoline-powered vehicles was found to be very low. In fact, gasoline-fuelled vehicles produced more carbon monoxide, sulphur dioxide, which caused damage to human cells, and hydrocarbons, which could cause cancer, he pointed out. However, the alcohol-engines emit more aldehydes, but the level of emission is, by no way, dangerous.

Dr. Chaudhary, quoting a Brazilian report, said the use of alcohol-engines had reduced the level of lead particulates in the atmosphere by 75 per cent in the city of Sao Paulo as an alcohol engine used alcohol-removing lead-based additives.

If the power-alcohol is manufactured year-round from cane molasses, the additional equipment needed in the existing distilleries are: Dehydration columns, separate boiler and turbo alternator and cooling tower with a total additional capital investment of Rs. 175 lakh.

The cost of production will be Rs. 7.40 per litre and Rs. 5.83 per litre for 30,000 litre per day capacity of power-alcohol plant working for 180 and 300 days in a year respectively. He said the power-alcohol, if produced in India, would reduce the annual petroleum consumption of the country, currently at 58 million tonnes, by 20 per cent and total expenditure would come down by about 10 per cent. The growth of petroleum consumption was at 9.4 per cent during 1990-91.

As such, the new device would further consolidate savings of petroleum and amount spent on its import. According to tentative estimates, all India deficit of petroleum products met by imports was 25 mt in 1991-92. It means that the production of power-alcohol will reduce the import volume by about 12 mt.

Furnishing more data, Dr. Chaudhary said the installed annual capacity of 200-odd distilleries in India was 15,86,928 kl, while actual production in 1988-89 was 797.32 million litres. As the total requirement of alcohol by industries in 1988-89 was just 545 million litres, it was possible to obtain surplus alcohol for fuel purposes, he noted.

He said sugarcane juice was also being used for the production of power-alcohol in Brazil, where about 58 litres of alcohol was produced from one tonne of sugarcane. However, the power-alcohol produced from sugarcane juice was costly compared to that produced from molasses.

He said India was currently consuming 3.77 million tonnes of petrol, that is in the 20:80 blend, the country would be needing 9.4 lakh tonnes of alcohol. This amount of alcohol was easily available from the country's surplus alcohol after the industrial requirements of 545 million litres out of the total production of 797.32 million litres (1988-89) were met, he observed.

AABIDA URGES RESTORATION OF ALCOHOL SUPPLIES

The All India Alcohol Based Industries Development Association (AABIDA) has urged the Maharashtra Government to lift the ten percent cut in the supplies of industrial alcohol to alcohol-based chemical units in the state. The Association has pointed out to the paradoxical situation where, on the one hand, alcohol units have had problems storing their excess production and on the other hand chemical units being forced to operate below capacity for want of raw material.

Production in Maharashtra, is reportedly better this year as compared to the previous year, and sources acknowledge that the cut enforced is largely to ensure adequate supplies to a unit expected to come up near Pune soon. The sources add that with the large requirements of this unit, alcohol-based chemical units are likely to face harsh times.

"The policy of cutting off alcohol supplies to the existing units in order to feed a unit not even ready is a clear case of misguided policies", the sources added. In the meanwhile AABIDA has, in a telegram, urged for urgent steps to ensure that all the alcohol is expeditiously allocated to the units in operation.

New EOU for dye intermediates at Baroda

Jaytick Organics Ltd., a 100 per cent export-oriented unit (EOU) for the manufacture of dye intermediates and chemicals, is being set up at GIDC Chemical Zone at Nandesari dist., Baroda, at a cost of Rs. 8.20 crores.

The EOU, being promoted by technocrats and professionals, intends to manufacture a wide range of dye intermediates and chemicals. There is inbuilt flexibility in the unit to make a variety of products. The company will also manufacture raw materials for its captive consumption in intermediates.

According to **Mrs. Jayshree U. Mody,** Managing Director, involved for many years in the manufacture and marketing of dye intermediate and chemicals, there is a growing demand for dye intermediates and chemicals in the international market. As such, there is no difficulty in achieving full capacity production and marketing of the company's products in international markets. It has already made arrangements for selling its products overseas.

Work at EOU is progressing in fast pace. Land has been already acquired, construction of factory shed is in the final stage, orders for plant and machinery is being finalised. The company is expecting first phase production by November 1992 and second phase by March 1993.

To part finance the project, the company is entering the capital market with a public issue of Rs. 4.30 crores in September 1992. Promoters' contribution is Rs. 280 lakhs, unsecured loans/deposits amount to Rs. 20 lakhs and term loans Rs. 90 lakhs.

The company hopes to do a turnover of Rs. 1,405 lakhs in the first year of operation; Rs. 1,701 lakhs in the second year and Rs. 1,945 lakhs in the third year. Capacity utilisation during this period will be 60 per cent, 70 per cent and 80 per cent respectively. Net profit after tax will be Rs. 338 lakhs, Rs. 412 lakhs and Rs. 512 lakhs respectively. The company hopes to pay dividend of 16 per cent in the first year, 20 per cent in the second year and 25 per cent in the third year. Expected earning per share is Rs. 4.75, Rs. 5.80 and Rs. 7.20 respectively.

Apart from Mrs. Jayshree U. Mody, the board of directors include **Mr. A.M. Rathod,** technocrat; **Mr. D.M. Pardiwala,** merchant-exporter; **Mr. V.G. Patel,** Director in Co-Op. Bank and chemicals business; **Mr. J.G. Nayak,** Chartered Accountant; and **Mr. D.R. Desai,** businessman and investment consultant. The shares of the company are proposed to be listed in all the major stock exchanges.

EOU FOR ALKALOIDS COMING UP IN ANDHRA PRADESH

Adithya Alkaloids Ltd. (AAL), promoted by Adithya Exports Ltd., (AEL) is setting up a 100 per export-oriented unit (EOU) for the manufacture and export of high-value alkaloids extracted from herbal products with an initial installed capacity of 3,150 grams of Vincristine Sulphate per annum.

The units located at Mekagudem village, Kothur Mandal, Mahaboobnagar district, Andhra Pradesh, has obtained know-how from National Chemical Laboratory, Pune. Ramani Chemasea Entech Systems, an industrial consultant on the panels of the World Bank and ADB, will be providing basic and detailed engineering consultancy services for setting up the plant.

The company's promotor, Adithya Exports Ltd., is a well-known merchant exporter with extensive contact in Europe and AAL will not have any difficulty in marketing its products in overseas.

An agreement with Global Chemical Co., Inc., (GCC), New Jersey, U.S., has also been signed under which GCC will assist AAL in obtaining approval from the Foods and Drugs Authority of the U.S. Catharanthus Roseus leaves are main raw material required and are grown on commercial basis extensively in Andhra Pradesh and Tamil Nadu.

The cost of the project is Rs. 410 lakhs. To part finance the EOU, the company will be entering the capital market with a public issue of Rs. 216 lakhs in July 1992 for which CCI consent has been received. CCI has also permitted preferential allotment of 10 per cent of the issue to the shareholders of the promotor company, Adithya Exports Ltd.

Adithya Exports Limited entered the capital market in May, 1991 with a public issue aggregating Rs. 1.80 crores. The issue received overwhelming response from the public and was oversubscribed 8.33 times. The company was set up with the objective of providing access to international markets for local bulk drug manufacturers.

The fact that AEL achieved an export turnover of Rs. 304 lakhs (previous year Rs. 133 lakhs) in its first year of operation after the public issue, i.e. 1991-92, with net profits being Rs. 54.65 lakhs (previous year Rs. 7.90 lakhs), is an indication of growth attained. The profits of the company are exempt from Income Tax.

GOOD RESULTS FROM INDIA GLYCOLS

India Glycols has produced good results for the year ended March 1992. The gross profit has soared to Rs. 34.65 crores, subject to audit, from Rs. 13.18 crores in the preceding year. The net sales have jumped to Rs. 73.20 crores from Rs. 48.77 crores. After depreciation (Rs. 11.81 crores against Rs. 11.01 crores), the net profit spurted to Rs. 22.84 crores from Rs. 2.17 crores a year ago.

Krishna Plastochem plans Rs. 6 crores expansion

Krishna Plastochem Ltd., a company engaged in the manufacture of one tonne per day each of plasticizers and esters at its plant at Vapi in Gujarat, has drawn up a Rs. 6.14 crores plan to expand its capacity to 3.5 t.p.d. of plasticizers and five t.p.d. of esters and also to diversify into manufacturing of five t.p.d. of oxalic acid.

Addressing newspersons at Calcutta on May 29, **Mr. Kishor Doshi,** Chairman of Krishna Plastochem, said equipment for the expansion and diversification project was being procured from indigenous sources and commercial production at the plant would commence from April 1993.

The basic raw material for the project was industrial alcohol which would be made available by the state government. The latter had assured the supply of nine lakh bulk litres of industrial alcohol to the plant and had also promised to increase supply of the same to 15 lakh bulk litres soon.

While during the first year the plant would require eight lakh litres of alcohol, requirement for the same would go up to 12.52 lakh litres during the third year of operations when the company would be operating at optimum capacity.

The balance of the 15 lakh bulk litres of raw material would be used for producing allied products at a later stage.

Mr. Doshi said the products of the company found wide applications in diverse fields such as textiles, pharmaceuticals, plastics, paints and leather, among others. Already, the company had received large orders for the same.

Marketing tie-ups with various industrial houses were being firmed up, he said. While there are no authentic data available on the supply and demand for plasticisers and esters in the country, estimates state that the production figures of plasticisers and esters are currently around 52,000 t.p.a. and 26,000 t.p.a. respectively. While 11,000 t.p.a. of oxalic acid is estimated to be produced in the country currently, the demand for the same is stated to be around 10,000 t.p.a.

Mr. Doshi said the company was exploring possibilities of export of the same to the US through Excel Industries and Punjab Chemicals which were currently exporting the same.

To part-finance the project, the company is entering the capital market on June 5, 1992, with a public issue of 31,20,000 equity shares of Rs. 10 each for cash at par aggregating Rs. 3.12 crores.

SUNITEE CHEMICALS TO SET UP H-ACID UNIT

Sunitee Chemicals is establishing a unit to manufacture H-acid and vinyl sulfone ester, two very vital raw materials for dyestuff industries. Promoted by entrepreneurs, **Mr. B.M. Saraf** and **Mr. Sushil Agarwal,** the company also proposes to export its products to the Western countries.

The company's plant is located at Bileshwarpura, district Mehsana, a notified backward area eligible for maximum cash subsidy, sales tax exemption for eight years and other incentives. The total cost of the project is estimated at Rs. 549 lakhs. Subject to the necessary clearances, the company will soon enter the capital market with an equity share issue to part-finance this project. The company is confident of achieving capacity utilisation of 80 per cent with a turnover of Rs. 1,294 lakhs.

Leather industry poised for export boom

Export of leather, the third largest foreign exchange earner for the country, is poised for a boom following devaluation of the rupee coupled with withdrawal of cash compensatory system (CCS) and hike in replenishment licence (REP) percentages for finished leather and leather products from India.

Export of leather products registered a four-fold increase in just four years, a feat unmatched by India's main competitors in the field such as South Korea, Taiwan, Hong Kong and Italy.

The growth in exports of leather products from Rs. 186 crores in 1973-74 to Rs. 2,600 crores in 1990-91 is due to the decline in the leather industry in some advanced countries like the United States, Germany and Britain for reasons of labour intensity, pollution and their growing dependence on imports.

At present only Spain, Portugal and Italy are the main manufacturers of what could be termed as speciality products that account for 20 per cent of the market of sophisticated clientele. In addition, the devaluation of the rupee will have a favourable impact on the Indian leather industry on two accounts. First, the demand for leather goods abroad is price-elastic (that is any reduction in price would lead to a difinite increase in international demand). This is mainly due to the fact that most of the developed countries have already vacated this sector.

Among India's main competitors, Hong Kong is in the process of vacating the manufacture of such items on account of wage cost-push. Other countries like Thailand and Indonesia could be regarded as new entrants. In such a situation, any reduction in price would definitely provide a competitive edge vis-a-vis the existing suppliers.

According to leather specialists, despite the heavy dose of CCS so far given to the industry, India's share in the world market has not shown any appreciable increase. It is possible that the rise in world demand which should result from reduction in price would more than offset any minor decline in exports brought about by decline in cash subsidies.

Besides, the increase in REP to 30 per cent with the additional inducement of high premium, should further boost export of leather products. The net effect of the policy has been that exports of finished leather has been brought on a par with leather products in grant of export incentives.

In relative terms, it means that while finished leather exports gain by 15 per cent in REP rate, leather products gain by only 10 per cent. Leather products lose CCS and are brought to the category of finished leather. The likely impact of the policy changes, as viewed by the leather products exporters is that the value-added products would be adversely affected due to diversion of finished leather from leather products manufacture exporters.

Similarly, due to shortage in the supply of finished leather in the country following increased exports, the prices of leather products might rise, thus largely multiplying the price advantage of devaluation. The new trade policy is bound to show tangible benefits, particularly in the longer run. In the short run the impact may be that exports of finished leather would receive a boost while leather manufacture would register a decline.

The increase that would be recorded by the sheer quantum of finished leather exports and consequently the forex earnings, should more than neutralise whatever setbacks anticipated in the exports of leather manufacture. India is also eminently suited as a major world supplier of finished leather. The country has perhaps the largest bovine population in the world.

Higher duty drawback rates announced

The Finance Ministry recently announced higher duty drawback rates for 161 items and fixed specific rates for seven new items. The new duty drawback rates, effective from June 1, continues existing rates for 127 other items. These include drugs and pharmaceuticals, cotton fabrics, leather products, sport goods and electronic items.

An official press release issued at New Delhi said the upward revision for 161 items was due to the increase in prices of a number of imported inputs, partial convertibility of the rupee and general increase in prices during the last one year. Duty drawback is paid as a refund of various indirect taxes paid by an exporter. The rates are determined every year after the budget is presented in February and they take effect from June 1. In the chemical sector the increase is reflected in paints, various plastic products, zinc oxide, litharge, incense sticks and some specified chemicals like caustic potash, potassium carbonate, potassium permanganate and potassium dichromate.

According to the new five-year export import policy, no drawback is admissible on the product exported under DEEC, therefore the existing provision of providing the reduced rates of drawback for exporters availing of the duty exemption schemes has been discontinued, the release stated. In addition there are some items for which the existing drawback rates have either been decreased or withdrawn. In the latter category the products are cotton gloves, variable PVC gang condensor, spectacle frames made of cellulose acetate sheets, ceramic cartridges, ceramic stylus, refills for vacuum flask with plastic outer cover, ethambutol hydrochloride (in bulk) and ethambutol tablets (400 mg.).

PROJECT FOR CARDANOL CLEARED IN KARNATAKA

Six industrial projects, involving a total investment of about Rs. 50 crores, have been cleared on May 18, by the state-level single-window committee of the government of Karnataka.

These include a Rs. 3.6 crores project for the manufacture of 5,800 tonnes a year of cardanol and residol, which are anti-corrosive chemicals used in paints and as surface-coating agents. These chemicals, which are currently being imported from Switzerland and Germany, will be derived from cashewnut-shell liquid by the plant which is being set up in Hosakote taluk and is slated to go into production by June 1993. The promoters are Jagdish Manek and Manohar Khokani from Bombay.

Flora Industries Ltd., promoted by the local entrepreneur M.S.A. Aleem, will be setting up a Rs. 2.80 crores project for the manufacture of 900 tonnes of degummed silk a year. The project is slated to come up in Anekal taluk and the technology for removing the gum from silk-waste will be indigenous and based on either enzymes or chemicals.

ICI SHOWS 14 PER CENT RISE IN INCOME

ICI India Limited showed a 14 per cent increase in its total income for the year with its turnover touching Rs. 868.2 crores. The company's gross profit which stood at Rs. 41.6 crores was also 30 per cent higher than the previous year.

Profit before tax from operations was Rs. 13.7 crores compared to Rs. 1.8 crores in the previous year. Profit from exceptional items was Rs. 12.9 crores, the release said. The release further said that after two years absence from the dividend list, the directors had recommended a dividend of Rs. 1.25 per share amounting to Rs. 5.1 crores.

These results, the release added, were underpinned by strong performance from fertilisers with high plant capacity and sales. Polyester staple fibre recorded a considerably improved performance with higher volumes and better plant efficiencies. However, the polyester staple fibre business throughout India continues to face problems from oversupply and high material costs.

DAVY POWERGAS BAGS ENICHEM CONTRACT

Enichem Synthesis, the Italian chemical company has selected Davy Powergas India (DPG) to design and build the 100 per cent export-oriented Chemical unit to be built near Baroda. The plant will produce copper phthalocyanine crude (CPC) a speciality chemical with wide application in the printing industry.

The project outlay is in the region of Rs. 55 crores and is scheduled for completion during early 1994. This will be the largest CPC plant to be built in India. DPG was responsible for transferring the technology for this project from Italy and a team of DPG Engineers spent several meets at the Italian plant for this purpose. DPG will be responsible for engineering, project management and construction services for the entire project.

AMIT ALCOHOL TO DIVERSIFY INTO ACETALDEHYDE MANUFACTURE

The board of directors of Amit Alcohol and Carbon Dioxide Ltd. held a meeting on May 21, and approved a major modernisation and diversification programme for the company. The diversification programme plans include the setting up of a plant, to produce Acetaldehyde — a vital raw material for the manufacture of pentaerythritol. Such reverse integration will assure continuous supply of raw material and will enhance the quality and profitability of their existing pentaerythritol plant.

COMPANY RESULTS

MRL's Excellent Performance — 1991-1992

Madras Refineries Ltd., has reported excellent performance for the year 1991-92. Achievements for crude throughput, lube, wax, bitumen and fuel and loss have exceeded even the MoU "Excellent" targets. LPG production was marginally short of the target due to the variation in the crude-mix allotted compared to the one planned in MoU. Table-I details the production record for the years. Capacity utilisation for the year was 99%.

Turnover

The turnover for the year 1991-92 was Rs. 1,600 crores as against the budgeted figures of Rs. 159 crores.

Profit before tax

The profit before tax was Rs. 73 crores as against budget figure of Rs. 68 crores and MoU excellent target of Rs. 72 crores.

Share capital

The company's paidup capital is Rs. 114.13 crores. Of this Government of India held 84.62% and National Iranian Oil Company (NIOC) 15.38%. Recently, Government of India has disinvested 20% of its holding amounting to Rs. 19.31 crores in favour of mutual funds/financial institutions/banks. With this Government of India holding will be 67.71%; that of NIOC 15.38% and that of mutual funds/financial institutions/banks 16.91%.

Memorandum of Understanding (MoU)

The overall performance rating of MRL for the year 1991-92 under the MoU taking into account all the items mentioned in MoU namely production, profit before tax, project completion and HRD activities is "Excellent".

Marketing

MRL met the full demand of market for feedstocks such as naphtha, LAB, MEK, polybutene, propylene, paraffin wax and SOFO oil to the downstream units.

MRL's PROJECTS — A REVIEW

Projects completed

MRL has completed the following projects successfully as per the original schedule during the year 1991-92.

Sewage water treatment plant

A sewage water treatment plant with a capacity of 2.5 MGD has been commissioned at a cost of about Rs. 25.40 crores. This project has been executed as a part of water conservation measures due to acute water shortage faced by Madras city and also to meet the additional water demands required for

future projects.

Modernisation of effluent treatment plant

As part of pollution control measures, the Effluent Treatment Plants were modernised to treat the effluents to Minimum National Standards (MINAS) at a cost of about Rs. 18.75 crores. The project has been completed and successful trial runs are being carried out.

Production of foodgrade hexane

A plant for production of 25,000 tpa of food grade hexane has been completed and commissioned at a cost of about Rs. 10 crores. The production of hexane by MRL would make the country self-sufficient in hexane. (A detailed report on this has appeared in Chemical Weekly 2.6.92 p. 60).

Modernisation of Instrumentation in old refinery

The refinery instrumentation control has been modernised at a cost of Rs. 26.13 crores. This will include online tank level information system, the first of its kind in India.

PROJECTS ON DUE

The following are the other major projects and all of them are progressing satisfactorily:

Lube expansion project

The project to expand the lube production capacity from 1,40,000 tpa to 2,70,000 tpa including 50,000 tpa of bright stock is under implementation at a cost of about Rs. 163.75 crores. This project involves construction of three new plants and revamping of two existing plants with necessary utilities and storage facilities. The units are scheduled for commissioning by May 1993. The foreign exchange saving on account of this increased production will be around Rs. 100 crores.

Cauvery basin crude distillation unit

A refinery to process 0.5 million tonnes per annum of crude available in cauvery basin is being put up at Nagapattinam at a cost of about Rs. 114.30 crores. The unit is scheduled for commissioning by July 1993.

TABLE-I
PRODUCTION

Item	OEB target = MoU very, good target	MoU Excellent target	Actual achievement
Crude Thruput ('000 T)	5410.0	5500.0	5524.0
LPG (incl. propylene and petrochemical feedstocks) — ('000 T)	135.0	140.0	133.6
Lube production ('000 T)	133.0	138.0	140.7
Paraffin Wax ('000 T)	13.5	14.0	14.2
Bitumen ('000 T)	200.0	205.0	214.6
Fuel & Loss (percentage of crude thruput)	7.7	7.5	7.3

Cauvery basin LPG separation unit

This project at Nagapattinam at a cost of about Rs. 40.40 crores enables recovery of LPG from the associated gas available in Cauvery Basin. This project is scheduled for completion in January 1994 and will make available around 15,000 mt of LPG for domestic use.

The products from the Cauvery Basin Crude Distillation unit and Cauvery Basin LPG Separation unit will be distributed in the districts of Thanjavur, Tiruchirapalli, South Arcot, Nagapattinam, Quaid-e-Milleth and Pudukottai.

Optimisation of refining capacity

This project for increasing the refining capacity of crude unit in refinery II at Manali from the existing level of 2.8 MTPA to 3.7 MTPA is under implementation at a cost of about Rs. 38.00 crores. The project is scheduled to be completed by December 1992.

Augmentation of power generation

MRL is putting up a power plant at a cost of about Rs. 88.00 crores with a view to augment the power and steam supplies for meeting the additional requirements of various new projects under implementation. Orders have been placed for two numbers of 20 MW steam turbo generators and two numbers of 130 tonnes per hour boilers. The project is scheduled for completion by May 1994.

Compressed Natural Gas (CNG)

The first indigenous CNG compressor station was successfully set up by MRL in January '92. The first bus of Cholan Roadways Corporation (CRC) which was converted to CNG mode was tested from safety aspects and was cleared for passenger operation in February 1992. The first CNG bus is currently running with passengers in Cauvery region. Another nine buses are under conversion.

Expansion of propylene capacity

A project for increasing the production of propylene from 17,000 tpa to 34,000 tpa at a cost of about Rs. 28.30 crores has been approved and will be taken up for implementation during 1992-93 and completed in thirty three months.

PROJECTS IN JOINT SECTOR

Indian Additives Limited

A company by the name of Indian Additives Ltd. (IAL) has been formed by MRL as a joint venture with M/s. Chevron Chemical Co., USA. IAL will manufacture a wide range of superior kinds of additives required by automobile industry, railways and marine engineering. The first phase costing Rs. 28 crores of the total investment plan of Rs. 48 crores will be completed and become operational by June 1992 and the remaining will become operational by March 1993.

Aromatics project

A joint venture company, National Aromatics and Petrochemicals Corporation Limited has been formed by MRL with SPIC as co-promoter for the production of 200,000 tpa of PTA, 30,000 tpa of o-xylene and 23,000 tpa of benzene at an estimated cost of Rs. 1,725 crores. Approval from the Government of India is still awaited.

PROPOSED PROJECTS

3 MMTPA refinery at MRL: Investment cost Rs. 100 crores

A feasibility report has been submitted to the Government of India for first stage clearance. In the meanwhile, planning commission has included this project in the Eighth Plan as also in the 1992-93 Annual Plan.

Benzene

A feasibility report for setting up a plant to produce 55,000 tonnes per annum of benzene has been submitted to Government. Estimated cost is Rs. 110 crores.

Port facilities

It has been found that the existing,

fully utilised facilities of Madras Port will not be able to cater to the growth and development of petroleum/petrochemical industries in the Manali area. Therefore, taking advantage of the creation of a new Port at Ennore, MRL has proposed to the Ministry of Petroleum and Natural Gas that this new Port should be built with facilities to cater to Ocean-going traffic of Petroleum/-Petrochemical products. It is learnt that the Ministry of Petroleum and Natural Gas is taking up this with the Ministry of Surface Transport.

Other petrochemical projects

The following other petrochemical projects are under study and may be started during Eighth Plan.

1) Facility for additional C4 feedstock
2) Aniline
3) Carbon black
4) Styrene/polystyrene
5) Polypropylene homopolymer
6) Butyl rubber
7) Methyl tertiary butyl ether (MTBE)
8) Diphenyl methane diisocyanate (MDI)/Toluene diisocyanate (TDI)
9) Styrene butadiene rubber
10) Methyl methacrylate (MMA)/Poly methyl methacrylate (PMMA)

RESEARCH AND DEVELOPMENT ACTIVITIES

Research and Development at MRL has made significant progress in FCC Catalyst Development in collaboration with IIT, Madras. Soon, the laboratory scale development will be completed and thereafter work on commercialisation will start.

In order to develop indigenous capabilities for lube extraction technology, MRL has embarked upon a collaborative programme with Engineers India Limited (EIL) and Indian Institute of Petroleum (IIP). A pilot plant facility at a cost of nearly Rs. 5.00 crores is getting ready at MRL R&D Centre, with a view to develop the technology for the design of new grassroot units as well as revamping of existing units. A team of Engineers and Scientists from MRL, IIP, EIL will use these facilities for the development of an indigenous technology.

ENVIRONMENT PROTECTION AND OHS

MRL has been playing a leading role in the protection of environment both at its plant location and in surrounding areas. During the last two years the company has planted over 1,20,000 tree saplings and has been ensuring its maintenance with a record success of about 90%. In addition we have developed gardens and traffic islands which have received prizes in various competitions. Recently, the garden in the R & D Centre of MRL received the prestigeous first prize in the contest organised by Tamil Nadu Tourism Development Corporation for the industrial gardens in Madras.

The petrochemical industry operates in the midst of potential health hazards. Occupational exposure to gases, complex mixture of hydrocarbons, other chemicals, heat stress, high noise level are encountered in the industry. This necessitates a constant vigilance through an occupational health programme aimed at protection of human health from the adverse consequence of exposures to these substances in the environment. With this need in mind, MRL has established during this year a centre for occupational health services. This centre is well equipped with latest equipments including precision apparatuses and testers to make a quick and high quality scientific work possible and is manned by a highly qualified team of doctors and scientists.

The centre carried out occupational hygiene monitoring of the work environment and periodic health examination of employees to ensure sound health of the employees. The centre will also provide professional and technical assistance to other neighbouring industries in Manali.

FUTURE PROSPECTS

MRL has on its anvil mega projects which include the aromatics project, refinery expansion by 3 million tonnes and a number of other petrochemical projects. The prospects for MRL are very bright and MRL continues its quest for technological and human excellence.

PLASTIC INDUSTRY SEEKS CUT IN CUSTOMS DUTY

The All India Plastic Industries Association (AIPIA) on June 1 urged the Government to reduce customs duty by at least 25 per cent on the plastic raw materials which are lying uncleared at the ports and are in the pipe line.

A delegation of the AIPIA led by its president, **Mr. R.N. Gupta,** called on the Finance Minister and explained to him how the 1992-93 Budget proposals had 'adversely' affected the plastic industry as the prices of raw material had gone up by more than 30 per cent.

The delegation suggested to the Minister that there should be common rate of customs and excise duty on all homogenous plastic raw materials as well as inputs. 'Such a step would protect revenue and avoid scope for manipulation by any importer and raw material manufacturer'', the delegation told the Minister, a press release issued by AIPIA said at New Delhi recently.

PACKAGING INDUSTRY FLAYS GOVT. POLICY

The All-India Flat Tape Manufacturers' Association has come down heavily on the ''repressive measures'' taken by the government to curb the plastic packaging industry at the behest of the jute lobby. The plastic packaging industry, with about 500 units, has a turnover of Rs. 800 crore per annum. Participating in a seminar on ''Plastics is bulk packaging'', **Mr. M.M. Sud,** president of AIFTMA, said the report of the Standing Advisory Committee constituted under the Compulsory Jute Act had not been acted upon even nine months after its submission.

TN to tax premium on Rep. licence sales

The Tamil Nadu Government has decided to levy sales tax on the premium earned by exporters on the sale of Rep licences, quota etc., with retrospective effect from 1989-90.

Exporters are up in arms against the move and are contemplating legal action. The immediate objective is to obtain a stay order, to prevent the Government from going ahead with its tax collection.

Besides the sales tax that will vary from five to eight per cent, a ten per cent surcharge, additional surcharge of five per cent and a penalty of 150 per cent will also be levied on all such earnings. Calculated thus, the tax liability of each exporter would run into several lakhs, it is said. In fact, so heavy will be the tax burden that all benefits announced by the Centre to promote exports will be more than wiped out. The exporting community is of the opinion that the TN move is completely unjustified, for Rep licences and quota are freely transferable and hence the premium earned thereof forms part of the incentive-package the Centre gives to encourage exports. Also, legally, sales tax, they say, cannot be levied on such income for it does not involve the sale of any product.

Obviously, the State Government does not share this view. Its line of argument being that since the Rep licences would ultimately involve transfer of products, a sales tax on it is perfectly justifiable. Another factor that is likely to have influenced the State Government in its decision is that in Karnataka, a similar tax is already in vogue. As is well known, only certain industries have use for the Rep licences. Garment exporters, for instance, rarely use it for the industry by nature is not import-intensive except for the one-time purchase of basic machinery. Such exporters are known to use the licence only to import items like zips — that too only occasionally. When exporters, having got an inkling of the State Government's intention to levy a sales tax, sought to raise the issue during the recent 'open-house' session with the Union Minister of State for Commerce, **Mr. P. Chidambaram,** he said the Centre cannot interfere in the matter as sales tax is a State subject.

In its note to the Secretary, Textiles, however, the Apparel and Handloom Exporters Association has pointed out that the Centre cannot afford to adopt such an hands-off approach for the imposition of sales tax will have debilitating impact on exports from the State. Despite the dire consequences, exporters do not believe that the State Government will be sympathetic to their cause for, as one industry source put it, "after all, the local government does not benefit (by way of resource mobilisation) much from exports".

RRL, Trivandrum submits proposal to American Cyanamid

An American multinational firm has proposed to take up further research on biorational insect control agents developed in India.

The Regional Research Laboratory (RRL), Trivandrum, a constituent of the Council of Scientific and Industrial Research (CSIR), has submitted a project proposal to the American Cyanamid Company of Princeton on the synthesis of novel hetrocycles as potential insect control agents and related chemistry.

Dr. A.D. Damodaran, director, RRL and **Dr. Vijay Nair,** RRL scientist, said investigations conducted on 'azadirachtin,' isolated from the neem tree, had revealed that it was an extremely potent anti-feedant and had growth disruption properties against a broad spectrum of insects wreaking havoc on a variety of agricultural crops.

Azadirachtin itself was obtained by a tedious process of isolation from neem tree extracts and the structural, complexity of the molecule had precluded its practical synthesis, they said.

The project, called biorational methods of pest control, are to synthesize pheromones of insects that devastate a number of important crops like cotton, lettuce, tomatoes and melons to isolate and identify anti-feedant principles of hpeqper species and the anti-fungal principle of pipzr kolibrenum and to synthesize chiral analogs of potent anti-feedants.

NCL REPORTS SUCCESS IN ISOLATING ENZYME FOR PAPER INDUSTRY

Scientists at the National Chemical Laboratory (NCL), Pune, have unearthed from the desert sands of Rajasthan a micro-organism that secretes an enzyme that could help produce high-quality paper and earn foreign exchange for India. A new chapter could be opened in paper technology if the xylanase enzyme from a microbe called Chainia is applied for commercial manufacture of paper, NCL scientists say.

The National Chemical Laboratory has entered into a joint venture with agencies abroad on research and management inputs needed for successful commercialisation of the enzyme. It is a laboratory under the Council of Scientific and Industrial Research (CSIR).

The success of the joint venture is expected to yield around \$3 million in foreign exchange to India in the coming years, according to NCL scientists. Their quest for rare species of micro-organisms with unusual biochemical traits led them to isolate an actionomycetes strain chainia from the sands of Haldighat in Rajasthan, which breaks down hemicellulose in plants.

Hemicellulose and cellulose are the major components of plant biomass. For paper manufacture, only hemicellulose must be dissolved to the minimum. NCL scientists claim their discovery to be the first of its kind in the world.

They have launched a joint programme with the Iowa State University in the United States and a leading US paper manufacturer for commmercialisation of the enzyme. The Pune scientists have purified the enzyme and attempts are on to get xylanase crystals, which are bigger in size and more uniform in appearance, for paper manufacture.

RUSSIAN KNOW-HOW FOR GREAVES COTTON'S ABS PROJECT

The Republic of Russia has agreed to offer the technology to the Rs. 73 crores ABS resin project being put up at Abu Road in Rajasthan by Greaves Cotton, sources at Jaipur disclose. The Russian equity will also be made available for the project to the extent of Rs seven crores.

The civil construction work of the project has now been started. The Rajasthan State Industrial Development and Investment Corporation Ltd. (RIICO) will also provide equity support to the tune of Rs. 2.90 crores. The total equity of the project is placed at Rs. 18 crores and the company has decided to go public shortly for part-financing the unit. The capacity of the plant has now been hiked to 20,000 tonnes per annum from the original 5,000 tonnes.

Sources in RIICO say that the project would go on stream by the end of 1994. It was about a year ago that RIICO had entered into an agreement with Greaves Cotton for the project. The delay in starting the work, sources disclose, has been due to the time taken in finalising the technology with the Russian republic. A frantic search is on to find a suitable foreign firm to extend the project TAE technological help.

JAUSS POLYMERS TO DIVERSIFY

Jauss Polymers Ltd. (JPL) has embarked upon a diversification plan, which will enable it to be one of the most versatile produces of polyethylene terephthalate (PET). The land has been already procured for the project and construction is underway. JPL was incorporated in February 1987. Its first plant was installed in Kurali, Punjab, for the manufacture of jars and bottles made of PET, PVC and other thermo-plastics.

The Kurali plant has an installed capacity of 200 tpa. Recently, it has set up its second unit in Ghaziabad, UP, with an installed capacity of 400 tpa. It has recorded a high growth since inception. With a sales turnover of Rs. 52 lakh in 1989-90, the sales stood at Rs. 1.5 crores at the end of 1991-92.

WB, ADB urge speedy reforms in hydrocarbons sector

The World Bank (WB) and the Asian Development Bank (ADB) have warned that future lending for the hydrocarbons sector, including the 4,000 crores gas flaring reduction project (GFRP) may be jeopardised by the slow pace of reforms and tardy decision-making reports *The Business & Political Observer*.

In detailed notes submitted to the Finance Ministry, these agencies have pointed out that defering of government approvals has affected the progress of several crucial oil sector programmes. The ADB has cited the instance of the delay in finalisation of the Kaul Committee report on the reorganisation of the ONGC. On its part, the World Bank has given the example of the NQP process platform contract approval for which was stalled by the ministry for six weeks, leading to a risk that the project may be delayed by one year. The World Bank has also expressed concern over the continuing slippages in the gas flaring reduction project (GFRP). The slippages are attributed primarily to difficulties in arranging foreign exchange and delays in clearances. It has noted that the project will become unviable in case delays stretch beyond two years.

The ADB has explained that a \$300-million loan for the GFRP can only be finalised after there is substantial progress in complying with policy reforms stipulated for the hydrocarbon sector. These include the submission of the Kaul committee report, which has already been held up by about three months. It has also pointed out that the government is expected to take a decision shortly on the recommendations of the oil pricing review committee and accordingly, adjust the wellhead price of oil for ONGC. This step would have to be taken before the GFRP loan proposal is submitted to the bank's board.

The ADB has, however, agreed to help India in obtaining co-finance from OECF of Japan and the World Bank for \$250 million and \$450 million respectively. But it says that donor support for the GFRP would be strengthened if a decision was taken to allow joint ventures for development of small to medium-sized oil and gas fields.

Similarly, it has suggested that if negotiations for the fourth round of oil exploration are completed before the board takes up the lending programme, it would help in obtaining strong donor support and help future bank assistance in the hydrocarbon sector. In its report, the ADB has urged the ONGC to submit a restructuring programme stipulated for funding to the Gandhar field development project.

24 bids for oil exploration received

Twenty four bids have so far been received for explorations, in the recently announced fourth round of bidding. Most of the interest seems to be in the proven oil fields, where the chances of striking oil are "high". In other areas the response has been below expectations.

According to an interested party who chose to keep away from the fourth round, the officials in the Ministry of Petroleum and Natural Gas led by **Mr. B. Shankaranand,** Petroleum Minister, failed to excite and bait the foreign companies. The supposed task force behind the delegation seems to be a farce as the information reeled out by the ministry was "absolutely outdated" and answers provided to valid queries were heartrendingly poor.

The fourth round has brought in 24 bids. The interested foreign parties include Atlantic Richfield, Albion, Shell, CFP of France and Amoco. Of these bids, one third are for two onshore blocks in the Kutch basin, a proven oil field. Also, out of 72 blocks offered, there is a scramble for 13 particular blocks. This is due to the fact that earlier the foreign companies had burnt their fingers while opting for unexplored oil belts. In the preceding three rounds, where multinationals participated, only 12 offshore wells were drilled but none yielded oil.

As against this, countries like China, Indonesia, Malaysia which also started their oil exploration at the same time as India, drilled thousands of wells so much so that they could favourably compete in the international market. This outcome in the Far Eastern countries is due to the system of open bidding which allows companies to bid as and when it suits them. The round system adopted by India attracts only those who are ready at that particular point of time. The oil majors are making a beeline for Russia, Pakistan and Iran although the political climate is far from stable in those countries. Another aspect which has deterred foreign companies from bidding for blocks was the poor geological and seismic data made available by the authorities. With advancing technology, the data acquired earlier was redundant except for minor shooting and processing for closer grids. This lack of information has resulted in only 25 per cent of the identified potentially hydrocarbon-bearing areas being explored, confined to the belts like the Cambay-basin in Gujarat, Assam-basin and Bombay offshore. Also senior oil industry officials feel technical information should be made available to multinational companies through agencies who specialise in this area.

With the provisional data offered to the present bidders the risk factor involved for oil strike is substantially high. The quality of blocks offered by Government has also irked the multinational companies, since the former has witheld proven blocks such as the Western offshore from them.

ONGC's attitude towards small and marginal fields has also left the companies high and dry, since on one hand it refuses to develop the small pool resources due to massive overheads and on the other, forbids private companies to take up the operations on contractual basis.

Leave alone the development of marginal pools, the manner in which tenders were invited has dampened the enthusiasm of private companies in the country. The inclination towards multinationals has also irked Indian companies resulting in backing out of giants such as Essar Gujarat, L&T and Reliance. Those Indian companies that have bid either singly or as part of consortium, include Hindustan Oil Exploration Company, Jindals, Mafatlal and Tata's Hitech Drilling. To acquire a professional outlook, ONGC and the Government appointed Arthur D. Little, an international consultant, to help them in framing the terms for the round. It is understood that the Arthur report had laid down bid terms on par with international norms. However, looking at the lukewarm approach by oil majors, it seems the Government has not paid heed to the report of the consultant. Multinational giants are reportedly interested in the entire exercise of exploration, production, distribution and trading. What needs to be done, a bidder said, is that the Government should be pragmatic and chalk out a new policy that would accommodate the public sector, the Indian private entrepreneurs and international oil majors.

1:2 BONUS BY KERALA CHEM

The board of Kerala Chemicals and Proteins has recommended a bonus issue in the ratio of one-for-two. In addition, it has jacked up the dividend to 50 per cent — being an all-time record — for the year ended March 1992 from 35 per cent paid in the preceding year.

According to a brief preliminary statement, it has earned a gross profit of Rs. 580.09 lakh. After depreciation of Rs. 27.38 lakh, taxation of Rs. 26.57 lakh, the net profit is worked to Rs. 526.14 lakh. After adjustments, the surplus is placed at Rs. 593.97 lakh. The dividend outgo is Rs. 70 lakh.

TRANSPEK INDUSTRIES FARES WELL

Transpek Industries has fared extremely well during the year ended March 1992. The gross profit has spurted to Rs. 11.63 crores, subject to audit from Rs. 4.79 crores in the previous year following a rise in net sales to Rs. 89.34 crores from Rs. 65.84 crores.

After depreciation (Rs. 2.09 crores against Rs. 1.75 crores) and taxation (Rs. 3.80 crores against Rs. 1.16 crores), the net profit has soared to Rs. 5.74 crores from Rs. 1.87 crores. Its exports have more than doubled to Rs. 13.33 crores from Rs. 6.15 crores.

Many hurdles to using gas from Bangladesh

Contrary to reports, (read with report in Chemical Weekly issue 2.6.92 pg 86)the import of natural gas from Bangladesh to boost power generation could only remain a distant possibility.

Though official circles contend that import of natural gas will be discussed with the visiting Bangladesh Prime Minister **Ms Begum Khaleda Zia,** for India it will be a pipe dream as a number of technical, economic and political complexities are involved.

The fact is that though natural gas imports could be utilised for power generation in West Bengal, no formal offer was made by Bangladesh to export the recently explored non-associated gas on their fields close to the borders.

Importing gas from Bangladesh, though first considered way back in 1980, no head way has been made and the hurdles are too many for realising any such proposal.

Even though India is keen on natural gas imports, Bangladesh has not made any written offer for such exports and according to indications it is favouring setting up a gas based power project on its side and export electricity to India.

While imports are necessitated for India due to severe resource crunch to tap its own reserves in Tripura and Assam, for Bangladesh it will be a major decision as it is an emotional issue in that country.

Moreover, a major hurdle in exporting natural gas to India will be laying down a pipeline across the river Yamuna. And, this ostensibly has been linked to building a bridge across the river which seems unlikely in the near future. The costs of the pipeline itself are exhorbitant and the bridge construction along which the pipe line has to be laid, will cost a fortune. According to estimates, the bridge will burden the Bangladesh exchequer to the tune of US \$1 billion. As per 1990 prices, the pipeline costs are put at US \$400 million. These estimates are yet to be revised, if the proposal for import has to be concretised.

Considering all these factors, the cost of gas will also not be economically viable. Apart from viability, any export of natural gas, according to reports, is seen in Bangladesh as "draining away the resources" by India. The risk in supply of gas is also high as it could be sabotaged by political and social pressure groups in Bangladesh against such exports.

India is keen on the gas imports as an open cycle gas-based power plant could be set up within 13-14 months as against a minimum gestation period of 50 months for a thermal power plant. Secondly, the capital investment for such a plant will be 33 per cent less than that a thermal plant. However, Bangladesh, according to indications is pursuing the idea of setting up a large power plant as a joint venture on its land and export electricity to India. This, sources maintain, was made explicit in our External Affairs Minister's visit to Dhaka way back in 1990.

Though informally the issue has cropped up at various levels, the first offer was made by a London based company Scimitar Exploration for selling natural gas to India. Bangladesh had a production sharing contract with Scimitar. The company had a contract area of 1650 sq.km in North-Eastern parts of Bangladesh, bordering Meghalaya and Assam. In a letter to the Ministry of Power, Scimitar sought an assurance for purchasing 8-10 million standard cubic mt of gas per day. But even as the Gas Authority of India Ltd. (GAIL) was corresponding with Scimitar, a group of Secretaries from the Ministries of Petroleum, Power and External Affairs met in May 1990 to discuss the import of natural gas.

EIGHTH PLAN DOCUMENT

Expeditious movement of coal to be facilitated

The Centre proposes to implement an action plan for large-scale movement of coal to power stations in southern and western regions in the next five years to arrest the serious mismatches in the supply and demand during the 7th Plan period.

The Plan would necessitate movement of large quantities of coal by coastal shipping from the eastern region to the southern and western regions and in turn call for creation of requisite loading and unloading facilities at several ports, according to the Eighth Plan document.

The development of Talcher and IB Valley (Orissa), North Karanpura (Bihar), Singareni (Andhra Pradesh) and Wardha valley (Maharashtra) would be given priority While Talcher would soon develop into a major source of coal supply in the country during the next decade, IB Valley would provide the alternative source for supplementing the coal needs in the eastern and southern regions, the document added.

Referring to the serious mismatches in coal supply and demand during the Seventh Plan, the document said due to various constraints, including railway transportation bottlenecks, the pithead stock of coal increased from 29.70 million tonnes on April 1, 1985 to about 37.43 million tonnes during 1990.

The stock buildup was largely in the coal fields of Bihar and West Bengal while there was considerable "unsatisfied demand" in the southern and western regions. The buildup was also partly due to poor quality coal as a substantial quantity of coking coal was found not suitable for use in the blast furnaces of the integrated steel plants. Consequently 4.45 million tonnes of coking coal had to be imported in 1989-90, the document said.

A number of improvements were suggested by an expert committee, constituted immediately after the formulation of the Seventh Plan, to facilitate increased coal production from Bihar and West Bengal, including setting up of captive power plants in the coal mining areas in the region. These projects which were to be commissioned in the Seventh Plan have however been now dovetailed into the Eighth Plan.

The improvements planned to be effected in the washeries for coking coal supplies to the steel industry have also got delayed. The document said as against the production target of 226 million tonnes for the Seventh Plan, the actual production achieved in 1989-90 was only 200.89 million tonnes, implying a shortfall of eleven per cent. The shortfall in production in the case of the Coal India and South Central Coal fields (SCCL) were nine and 26 per cent respectively. The shortfall in SCCL, which was expected to cater to the requirements of the consumers in the South, resulted in adhoc changes' in coal linkages to the consumers and, consequently, considerable irrational movement of coal.

The level of coal production that would be realised by 1996-97 has been estimated at 308 million tonnes against an anticipated demand of 311 million tonnes. The poor performance of the coal industry has been attributed to the low productivity levels of men and machinery and inspite of increasing mechanisation undertaken over the years, the industry still employed more than seven lakh people.

To tone up production, the Government has decided to step up productivity target for underground mines of Coal India to 0.66 tonnes by 1996-97 against an achievement of 0.55 tonnes in 1989-90. The areas that call for special attention for increasing production are introduction of rapid loading systems, modern communication facilities and conversion of manual and semi-mechanised operations to mechanised ones, wherever warranted.

CIL CHIEF WANTS ANALYSTS TO TEST COAL GRADES

The Chairman of Coal India Ltd (CIL), **Mr. S.K. Chowdhary,** has called for the appointment of public analysts for testing the grades of coal and joint inspection with consumers to verify the authenticity of weights to satisfy consumers at pithead. Talking to industrialists of the PHD Chamber of Commerce and Industry (PHDCCI) in New Delhi on May 26, he also agreed to simplify procedures for lifting of coal by road. The chamber delegation was led by **Mr. P.K. Jain,** Chairman of the telecommunications, civil aviation and tourism committee. Mr. Chowdhary emphasised the need for coal quality determination and monitoring of the consignment.

FEDO BAGS BPCL ORDER FOR OIL TERMINAL

FACT Engineering and Design Organisation, (FEDO), the engineering consultancy division of the Fertilisers and Chemicals Travancore Limited, a Government of India enterprise, has bagged an order to provide engineering consultancy and management services to set up the Cauvery Basin oil terminal of Bharat Petroleum Corporation, Bombay. The terminal proposed at Nagapattinam in Tamil Nadu, is intended to provide storage facilities for the products of the Cauvery Basin refinery being built by Madras Refineries Ltd. The scope of FEDO's services includes basic engineering, detailed engineering, procurement assistance, construction and project management. The Rs. 500 mllion project, is expected to take 15 months for completion, a FACT release said at Kochi recently.

EIGHTH PLAN DOCUMENT

Greater utilisation of natural gas urged

Flaring of natural gas is expected to be completely eliminated by the terminal year of the Eighth Plan period, as part of an integrated strategy to reduce energy imports.

According to the Eighth Plan document, as approved by the National Development Council, this strategy would also focus no restriction of oil imports to reasonable levels and accelerating the pace of indigenisation during the plan period.

The unrestricted demand for petroleum products has been paced at 81.19 million tonnes, whereas indigenous output of oil is expected to be about 47.08 million tonnes, which woud leave a gap of 37.2 million tonnes to be imported, or a 26.5 per cent increase from the current level of 29.4 million tonnes.

Since the foreign exchange situation was likely to be difficult for such oil imports, the plan would focus on restricting the oil budget as far as possible and containing it to present levels. One of the ways suggested by the Eighth Plan document is improvement in consumption of natural gas and substituting other petroleum products such as naphtha with gas wherever possible.

During the Seventh Plan period, cumulative output of gas was about 59.65 billion cubic metres (CUMs) whereas actual utilisation was only about 40.41 billion CUMs and almost 19 million CUMs had to be flared off. During the current plan period, however, the output in the terminal year alone is expected to reach 30.17 billion CUMs and infrastructure is in the process of being augmented for improving gas utilisation and boosting the existing capacities of the pipeline network for transporting gas. Among the proposals being examined is the setting up of gas-based power stations, since these stations have relatively short gestation periods. Plans were also underway for using gas as feedstock for production of petrochemicals.

The document says among the other proposals being examined, is utilisation of gas for production of liquid petroleum gas (LPG) to reduce imports of kerosene and LPG. In the transport sector, use of compressed natural gas as an alternaive to motor spirit and high speed diesel oil, would be promoted and pilot plants for production of middle distillates commissioned, using gas as feedstock.

As for restriction in imports, the Eighth Plan would focus on demand compression by at least two to three million tonnes per year by the terminal year. Demand management would be taken on a war footing in energy-intensive industries, such as the transport sector, where focus would be on shifting of freight movement from road to rail and encouraging the switchover from personal transport to public transport.

At the same time, maximising indigenous production of crude oil would be taken up, so as to achieve a production increase of 1.5 million tonnes per year by 1996-97 through rehabilitation of sick and idle wells. Private sector investments in oil exploration and development is also expected to yield an additional output of 0.75 million tonnes.

To augment the indigenous production levels, exploration in category one basins (Assam, Krishna Godavari and Cauvery) would be intensified. In other basins such as Rajasthan and Kutch, a mix of intensive and extensive exploration would be adopted, since these areas have already yielded promising leads.

The metreage of development drilling during the Eighth Plan is being planned at 3809.36 metres, which is a 37 per cent increase over the Seventh Plan.

TEMPORARY RESPITE IN NTPC-CIL PAYMENT ROW

A last-minute plea by the chairman of the fund-starved National Thermal Power Corporation (NTPC) has staved off a May 31 deadline set by Coal India Ltd. (CIL) to cut supplies to all its thermal power stations, unless it cleared piled up dues of Rs. 100 crores.

Mr. Rajendra Singh, Chairman and Managing Director (CMD) of NTPC met the CIL CMD, **Mr. S.K. Choudhury,** on May 29, and promised to cut down on the outstandings and clear up all current bills. A face saving immediate down payment of Rs. 10 crores to CIL was also reportedly agreed upon. CIL has claimed that NTPC had been flouting the "cash and carry" scheme which was introduced by it last October.

Meanwhile, NTPC itself is in a somewhat "alarming position" — arm twisted for outstanding payments by the raw material suppliers, but not in a position to do the same with the state electricity boards (SEBs) which owe it large sums of money.

KAWAS UNIT TO EASE GUJARAT, MP POWER SHORTAGE

The successful commissioning of the second 105 MW unit at the Indo-French gas power station in Kawas, near Surat in Gujarat on June 1, would help ease the power situation in Gujarat and Madhya Pradesh — grappling with a serious energy shortfall of 15 per cent this summer — along with Maharashtra. The National Thermal Power Corporation (NTPC), which designed this 654 MW gas power project with French know-how, will activate the remaining two gas turbines and steam turbines within a year, a NTPC release in Nagpur said.

DRUGS, CHEMICALS:

Exports to grow by 50 per cent

Indian exports of chemicals, drugs and pharmaceuticals are expected to grow at the rate of 50 per cent in rupee terms during 1992-93, inspite of the US action under special 301 of its trade act. The growth in dollar terms is likely to be 20 per cent, according to **Mr. Ramu S. Deora,** Former President of Federation of Indian Export Organisations.

United States has slapped duties ranging from three per cent to 17 per cent on different items in retaliation to what it calls inadequate protection to its patents by India. Mr. Deora, who was talking informally to pressmen said India's exports of drugs, chemicals and pharmaceuticals to United States amounted to Rs. 450 crores or nearly 13 per cent of its total exports of Rs. 3,520 crores.

India's export of drugs, chemicals and pharmaceuticals are expected to record good growth as the production does not require any import content and stand to gain from the devaluation of the rupee.

Exports of chemicals and pharmaceuticals during 1991-92 registered a growth of 49 per cent in rupee terms and 16.7 per cent in dollar terms compared to 1990-91. With a 65 per cent growth rate in rupee terms and 24 per cent in dollar terms, exports to the general currency area (GCA) countries showed a remarkable upswing. Exports to GCA went up to Rs. 2,406.7 crores in 1991-92 from Rs. 1,456.9 crores in the previous year.

Of the total exports, drugs and pharmaceuticals with exports worth Rs. 912.4 crores, showed a growth of 95 per cent to GCA in overall exports of Rs. 1,281.1 crores as against Rs. 784 crores in 1990-91. Dyes, intermediates, alcohol and coaltar with exports worth Rs. 836.1 crores also had a good growth of 65 per cent.

Basic inorganic and organic chemicals, including agro-chemicals too had a good growth in exports of 51 per cent to Rs. 457.6 crores from Rs. 302.8 crores in 1990-91. Another product group having a good potential for exports was glycerine, soaps, detergents, cosmetics and toiletries, which recorded a growth of 36 per cent in 1991-92.

SEVERAL DRUGS SOLD ABOVE DPCO PRICES

Drug companies have started flouting the provisions of Drug Price Control Order(DPCO), 1987 with several firms selling bulk drugs at prices higher than those notified, reports *The Business & Political Observer*.

Some of the drugs being sold at higher prices are ethambutol, cephalexin, pyrazinamide, trimethoprim, ampicillin trihydrate, metronidazole, sulphamethoxazole, vitamin C and paracetamol. The companies are overcharging these drugs on pretexts of special processing charges, packaging charges, transit insurance and freight.

As per the para 3 (3) of the DPCO, 1987, no drug manufacturer should sell bulk drugs at prices exceeding those fixed by the government. Any contravention of this provision is punishable under section 7 of the Essential Commodities Act, 1955.

However, the department of chemicals has taken action against only one company for selling ethambutol at higher price. Most others, however, continue to sell the drugs at their own prices despite complaints by the formulators.

Drug industry associations have supported the move by the pharmaceutical companies in overcharging the bulk drugs. In response to a government note, they have said that they can do little as even a reasonable hike has not been allowed. The exercise of price revision of both bulk drugs and formulations has been extremely slow since 1987 when the new DPCO was issued covering 150 bulk drugs. It used to take a minimum of four months for getting a price revision application cleared until last year. This year, the process has come to a virtual halt. The producers are demanding a hike as cost of production has gone up due to devaluation and the need for obtaining foreign exchange at market prices.

BLENDING OF SCIENCE WITH CULTURE URGED

There is a pressing need to unify western science and Indian science with the Indian socio-cultural milieu, according to **Dr. D.N. Srivastava** of the Bhabha Atomic Research Centre (BARC). The fact that science had so far belittled the importance of culture, was the chief factor for our underperformance in the field of science and technology, he said, addressing a day-long symposium on 'Why We Underperform in the Field of Science and Technology?', in New Delhi recently.

Pointing out the variance in approach between western and Indian ways of search of knowledge, whose basis lay in the contrasting needs of life due to different environmental conditions, Dr Srivastava said whereas the west has explored nature through space, light and matter, India did it through time, sound and mind. He emphasised that both the methods — the former, a tangible, horizontal route and the latter, a tanscendental, vertical route — had their advantages, and were complementary. He said Indian scientists of the post-independence period had just 'imitated' western science and made no original contribution in the last 45 years.

Dr. Srivastava stressed the need to encourage intellectuals striving for a synthesis between the two sciences, and said such a unification would bring India to the forefront in all spheres.

C-Itoh to fund RIL's PP, HDPE project

The Reliance group is on the point of entering into an equity tie-up with the fabled C-Itoh and Company of Japan for its two mega projects totalling Rs. 1025 crore, for which the group will launch two simultaneous mega capital issues totalling Rs. 650 crore shortly.

Reliance is also negotiating with leading foreign technology suppliers for transfer of technology to the two mega projects, which would be completed by the last quarter of 1994.

C-Itoh is one of the world's largest trading houses, with a turnover of US $150 billion in 1991. The company is engaged in trading in textiles, real estate, metals, chemicals, food and agricultural and forest products. Reliance has set aside firm allotments of both equity shares and CDs of both issues for C-Itoh.

The mega issues, coming soon after Reliance's $100 m Eurobond issue, pertain to projects for making polypropylene (PP) and polyethylene (PE) respectively at Hazira, and are of Rs. 325 crore each. Both projects have been appraised by the Industrial Credit and Investment Corporation of India (ICICI) and the Bombay-based JM Financial Services has been appointed Lead Managers to the issues. The projects will be entirely funded by equity and convertible debentures (CDs).

According to its unaudited working results, Reliance Industries Ltd. (RIL), the flagship of the group, has ended 1991-92 with a turnover of Rs. 2297 crore, with a net profit of Rs. 163 crore on a paid up equity capital of Rs. 152 crore.

One of the two new companies is christened Reliance Polypropylene Ltd. (RPPL) and was originally called Nim Investment and Leasing Ltd, incorporated in 1986. Its project proposes to make 2.5 lakh tonnes per annum (TPA) of various grades of PP. RPPL's project cost is Rs. 525 crore, and is the bigger of the two.

Of the equity issue for RPPL, Rs. 40 crore would be set aside for existing shareholders of the company, Rs. 60 crore for RIL, its associates and C-Itoh, with the actual public offer in equity totalling Rs. 25 crore (2.5 lakh shares of Rs. 10 each for cash at par).

On the CD side, firm allotment of Rs. 100 crore has been set aside for RIL associates and C-Itoh, with the actual public issue (including reservation for employees) totalling Rs. 300 crore. The debentures bear 16% interest and will have a face value of Rs. 50. They would be converted into one equity share of Rs. 10 each at a premium of Rs. 40 per share a year after the date of allotment.

The entire requirement of propylene, the chief raw material for making PP, will be met from RIL's emerging naphtha cracker complex. The uses of PP are in woven sacks, BOPP film, sheets and pipes, fibre and filament yarn and monofilaments and ropes. The Central Committee for Perspective Planning of Petrochemicals Industry (1986-2000 AD) has put the supply gap for PP at 1.5 lakh tonnes in 1994-95, which would further rise to 2.84 lakh tonnes in 1999-2000.

The other company, Reliance Polyethylene Ltd. (RPEL), was incorporated as Sincere Leasing and Investments Ltd. in 1986. This project involves an outlay of Rs. 500 crore and proposes to make 1.6 lakh tonnes per annum of high density polyethylene (HDPE). While the break-up of equity financing remains identical to that of RPPL, the CD issue will have Rs. 75 crore set aside for firm allotments to RIL, associates and C-Itoh. The face value of debentures and the mode of conversion remains the same. HDPE is used in household articles, toys, chairs, luggage, paints, detergents, chemicals, cosmetics, sacks for pesticides and fertilisers, pipes, films and coatings for packaging industry and for a host of other uses.

The perspective plan for the petrochemical industry has put the supply gap for HDPE at 2.06 lakh tonnes by 1994-95, which would go up to 3.83 lakh by the turn of the century. Both the companies are chaired by **Mr. Anil D Ambani,** Joint Managing Director of RIL.

While RPPL has **Mr. P.N. Devarajan,** the former IDPL Chairman, and **Mr. J.S. Bakshi,** former IPCL Chairman on its board RPEL has roped in **Mr. H.S. Kohli,** former Chairman of KRIBHCO and currently President of Reliance Petrochemicals Ltd (RPL) at Hazira.

INDIA TO SIGN MONTREAL PROTOCOL

India will sign the Montreal protocol on phasing out chlorofluorocarbons (CFCs) shortly, Union Environment and Forests Minister **Mr. Kamal Nath** announced in New Delhi on May 29. He told newspersons that a decision to this effect had been taken at the highest level as all the remaining 20 countries had ratified the amendments to the protocol.

The Minister said the "instrument" would be formally handed over by the Indian authorities at New York. Giving details of the protocol, he said a Montreal fund was already functioning and it was an "open ended" arrangement. Under the protocol, 1995 was the base year and actual reductions would have to start from the year 2001, he said. Mr. Kamal Nath said the exercise to chalk out a programme for phasing out CFCs had begun about two years ago and, *prima facie,* the cost of the same had been worked out at Rs. 3,500 crores.

MANAGING PRICE SUPPORT FOR NR:

Greater role for tyre companies sought

The State Trading Corporation (STC) may soon see its role in the price support operation for raw rubber substantially curtailed, with the private sector tyre companies negotiating with the government to allow them to undertake the activity.

A final scheme in this regard is presently under discussion between representatives of the tyre industry and the Reserve Bank of India (RBI). The scheme envisages that tyre companies would enter the market to buy up those grades of rubber which are used in the manufacture of tyres, leaving the procurement of other grades to the State Trading Corporation.

The industry has requested the Reserve Bank of India to direct banks to increase the credit levels to be extended to the tyre companies, instead of giving that money to the State Trading Corporation for procurement of excess rubber stocks for consumption by the tyre industry.

The government has already agreed in principle to the tyre industry's request for additional credit for the price support operation.

The State Trading Corporation has been procuring rubber during the peak season from the market in order to ensure a minimum support price for the growers. According to the present mechanism, STC enters the market during a glut whenever the price of natural rubber falls below the trigger level of Rs. 21,150 per tonne.

However, the tyre industry maintains that tyre companies, because of the technical skills at their disposal, possess better knowledge than the STC in storage of natural rubber.

According to the recent estimates released by the import-export committee of the Rubber Board, stocks at the end of January 1993 would reach a high of 1,22,000 tonnes, which is equivalent to a consumption level of three-and-a-half months. This is against the accepted norm of maintaining a stock level of two month's consumption.

Such high levels of stocks is expected to depress the market prices to levels below the benchmark price determined by the government. It has been estimated that with stocks at this level, the STC would have to garner 40,000 to 50,000 tonnes of rubber, which in itself is a daunting task. On the current fair price of Rs. 21,450 per tonne, the procurement is expected to cost about Rs. 106 crores.

Sources say such high levels of procurement may necessitate exports, which they feel is not a feasible proposition. They say that demand in the export market is mainly for RMA-IV grade rubber. However, what would actually be in excess in the domestic market is off-grade rubber.

Thus, if RMA-IV grades are exported, then in the lean season of 1993, shortage would arise for sheet rubber mainly used by the tyre industry, thereby necessitating imports, which again is not desirable, sources say.

Industry sources are, however, apprehensive about the reaction of the rubber growers' associations to the proposed scheme of involvement of the private sector in the price support operation.

The sources say the associations have always viewed actions taken by the industry with suspicion.

However, they point out that the scheme under negotiation with Reserve Bank of India will be beneficial to the growers.

HPCL planning sulphur recovery unit at Vizag

The Ministry of Petroleum has agreed in principle to Hindustan Petroleum Corporation Ltd.'s (HPCL) proposal for tie-up with ARI of the United States for securing basic engineering and technology for setting up a Rs. 18 crore sulphur plant at Vizag.

A refinery emits sulphur dioxide, which is injurious to health, following the burning of hydrogen sulphide in the furnace. The proposed sulphur plant to be located at HPCL's Vizag refinery is to reduce sulphur dioxide emission of the refinery.

HPCL, according to informed sources, is also putting up two plants, one each in the refineries in Bombay and Vizag, at an estimated cost of Rs. 15 crores each, to upgrade the quality of liquid effluent before it is released out of the refineries.

In Bombay, a Rs. 15 crore water treatment plant is already in operation. The plant collects the sewage water, treats it before making it available for use for cooling purposes.

Among HPCL's major projects in hand are the LPG importation facility at Mangalore port, laying of a product pipeline network between Vizag and Vijaywada and installation of a propylene recovery unit at Vizag.

The creation of LPG importation facility at Mangalore complete with a storage capacity of 16,000 tonnes is estimated to cost Rs. 150 crores, while the pipeline network will cost Rs. 250 crores.

The proposed propylene recovery unit is to recover about 23,000 tonnes of propylene annually from LPG in a refinery whose yearly throughput is 4.5 million tonnes. The Rs. 26-crore project is expected to be completed this year.

PENICILLIN G PRICES REVISED

The Government has revised upward prices of potassium and sodium penicillin-G. The notified price of potassium penicillin G first crystals has now been raised to Rs. 886 per Billion Units (BU) from Rs. 830 per BU.

Sodium penicillin G IP is now priced Rs. 1573 per BU. Sources say that this is the third time in the last fifteen months that the prices of penicillin G salts have been revised upwards.

Interestingly, the immediate beneficiaries of this price revision will be the two public sector units viz Indian Drugs and Pharmaceuticals Ltd. (IDPL) and Hindustan Antibiotics Ltd. (HAL) as these are the two major units manufacturing this drug.

INDO-KOREAN PROJECT TO MAKE PRECIPITATED SILICA

In a joint Indo-Korean venture, South Korea's Lunar group and Samyoung Chemical Industries Ltd. are taking 40 per cent equity in Sunrise Polycon Ltd.'s Rs. 21.35 crore project to manufacture precipitated silica, an import substitute product widely used as a filler in rubber, paint, pharmaceuticals and the adhesive units. Samyoung Chemicals is one of the leading producers of silica in the world and will provide to the Indian company the latest know-how and also access to its research and development.

Sunrise Polycon will manufacture silica under Samyoung Chemical brandname, Sysil, and over 60 per cent of the production of the Indian company would be bought back by the Korean company.

PPL's losses wipe out equity base

In a classic case of public sector inefficiency, the Paradeep Phosphates Ltd. (PPL), a fertiliser company under the administrative control of the Ministry of Chemicals and Fertilisers, has suffered an accumulated loss of Rs. 125 crores resulting in the erosion of its entire equity base. The Bhubaneswar-based company that has its manufacturing unit at Paradeep, is virtually in the throes of crisis because of the Central government's indifference, serious cash flow problems, top management infightings, trade union rivalries and non-adherence to environmental safety standards.

Unless the Centre sorts out the Nauru government's threat to withdraw the 49 per cent equity stake in the company and entrust its management to successful public or cooperative sector firms like the National Fertilisers Ltd. (NFL) or the IIFCO, PPL would have to close down its operations, company sources said.

PPL was launched in 1981 as a joint venture between the Indian government and the Republic of Nauru to make di-ammonium phosphate (DAP), a high-valued fertiliser. Its first phase successfully manufactured DAP using imported phosphoric acid. Plans in the second phase to manufacture phosphoric and sulphuric acids from imported raw material ran into problems due to infighting at the top managerial levels. This resulted in mounting losses that finally wiped out the total equity base by March 31, 1992. The Nauru government demanded its investments back. An offer by a Bombay-based private shipping company to buy the Nauru shares at face value was not permitted by the government. Even the public sector National Fertilisers Ltd's offer to take up an equity in PPL was not considered, sources said.

Though the Paradeep unit has a capacity to produce 720,000 tonnes of DAP, its actual production ranged between 350,000 tonnes and 370,000 tonnes. For each tonne of missed production, the notional loss by the company is Rs. 1,300 crores. The trade union has accused the management of not taking adequate care of the company's interests. The chief executive of the company who had only a 22-month tenure before super-annuation was accused of enjoying his official perks and privileges rather than completing the second phase of the unit in time. The unit has been shut down after initial trials due to some minor design defects. Nothing is being done to correct the snag and put the second phase on stream, they said.

Meanwhile, the slump in the price of DAP in the international market has added to the woes of PPL. While the indigenous production cost per tonne of DAP is Rs. 8,500, its imported cost is only $233. This artificially inflated cost has to be corrected by realistic pricing of raw materials without customs duty, the sources said.

FERTILISER OUTPUT TARGET AT 10.45 M.T.

The Government has fixed the overall production target of fertiliser at 10.45 m.t. for the current financial year. This contains 7.70 m.t. of nitrogen and 2.75 m.t. of phosphates.

The target for the year is about 6 per cent higher than the production of 9.86 m.t. achieved during the last financial year, said a press release. Production of nitrogenous fertilisers during April 1992 was 5.05 lakh tonnes against the target of 4.88 lakh tonnes, which is 3.3 per cent higher than the production achieved during the corresponding month of last year.

The average capacity utilisation during the month worked out to 73 per cent for nitrogen, while 2.52 lakh tonnes of DAP,23,000 tonnes of urea and 1.33 lakh tonnes of Muriate of Potash (MoP) arrived at the ports.

UN REPORT WARNS ON GLOBAL HEATING

The political drive to combat global warming has received powerful scientific backing with the publication of a report from the United Nations intergovernmental panel on climate change (IPCC) to the Earth Summit in Rio de Janeiro. IPCC predicts that human activities will heat up the world during the next century, by pumping carbon dioxide and other "greenhouse gases" into the atmosphere.

There is, however, still uncertainty about the scientific processes involved in global warming. It is also impossible to know how much the world population and industrial activities will grow, and how much greenhouse emissions will be reduced by concerted international action to reduce consumption of carbon fuels. IPCC studied six scenarios and each shows an appreciable increase in global temperature. The average increase is likely to be somewhere between 1.5 degrees celsius and 3.5 degrees celsius over the next 100 years. Even warming at the bottom end of this range could raise sea levels by 50 cm—enough to flood low-lying countries such as Bangladesh. Agriculture in some parts of the world would be devastated.

ICCL STARVED OF COAL

The Indian Charge Chrome Ltd. (ICCL), a 100-per cent export-oriented unit (EOU) of the IMFA group, is starved of coal supply for its captive power plant, the largest owned by any private company in the country. A company release issued at Bhubaneswar said ICCL's captive unit had been contributing power to the state grid. It said while initially the railways reduced coal movement from its monthly requirement of 55,000 tonnes to 33,000 tonnes in May, the movement of coal had been completely stopped, apparently under the instructions of the Railway Board.

Jute goods export — setbacks feared

The Food and Agricultural Organisation (FAO) has predicted that developing nations exporting low-cost jute projects are likely to face a severe setback in future due to high levies and the bias against jute in the tariff schedules in these countries. FAO has, therefore, recommended lowering of tariffs on jute products in order to help access markets better. In its report "import tariffs on jute in developing countries," FAO says high levies would also result in a possible displacement of jute packaging by synthetic packaging in the developed nations.

In order to match the world wide recession that is likely to hit the global market of the exporting developing nations, FAO feels that much of the barriers against jute both of the tariff and non-tariff types could be eliminated with the developing nations entering into bilateral trade agreements. Some positive results have already been obtained by the developing nations with the adoption of the new system of Generalised Scheme of Preferences (GSP).

It has also recommended that consideration needed to be given by importing countries to the costs and benefits involved in the protection of domestic industries producing packaging materials either from synthetics or from domestically grown natural fibres. Based on the information obtained mainly from the General Agreement on Tariffs and Trade (GATT) and the trade control measure information system (TCMIS) unit of UNCTAD, FAO says high tariff and non-tariff barriers are likely to play a negative role in the possible entrance of jute products in the markets of the developed countries.

This will undoubtedly contribute to the difficulties in expanding exports to these countries, particularly with the synthetic industry fully developed and its channels well established. With the present system of high duty rates and import tariffs continuing for long jute sector exports from the developing countries to the developed will be compelled to take the back seat. Apart from this, quantitative restrictions pertaining to high duties and tariff schedules had also provided a shield behind the synthetic packaging products industry which had already developed with the support from the abundant supplies of petrochemical raw materials.

Synthetic raw materials such as polypropylene (PP) are now imported into all developing countries and the use of such materials are likely to be augmented in the days to come with some of the developing nations working out plans to manufacture them indigenously. An analysis of market prospects suggests that global polypropylene supplies will be ample and prices relatively lower over the medium term.

With the synthetic packaging industry already maintaining distinct edge over jute packaging due to its low cost of production on being less labour intensive had resulted in the collapse of the jute industry in the developed nations. This was evident from the low rate of consumption of jute products in the developed countries between 1969-71 and 1979-81. During this period consumption of jute products in the developed nations came down by around one million tonne every year. The fall was around one third of the earlier consumption.

The void, expectedly, had been filled by the packaging industry with a manufacturing technology having a little additional cost as against the required for producing jute products. While 14 developed nations accounted for 73 per cent of the world jute and jute goods trade, 89 LDCs contributed 88 per cent of the world trade. However, the tariff structure shows that the highest concentration of LDCs was found in the biggest tariff segments. A large number of developed countries were found to be in the free category against only a few developing nations. Tariff rates on individual items like raw jute was practically free of duty in most developed markets, while it was subject to one to 14 per cent in 26 developing nations and 15 to 59 per cent in 33 of them. Thus about 70 per cent of the raw jute importing developing countries imposed tariffs on the item. Again one third of them imposed rate of 15 per cent and above.

On jute yarn while nine developing countries were found to have no duty at all, only two have offered this facility. Moreover, half the developing countries had duties in excess of 30 per cent and a tariff range of 30 to 59 per cent had been imposed in 22. Suprisingly, no developed country fell in the latter category.

The pattern of tariff differences between the developed and developing countries with regard to other jute products such as hessian and sacks was also similar to that of yarn. According to assessment made by FAO, keeping in mind the discriminatory tariff structure prevalent among the developed and developing nations on jute products, imports from the latter which currently occupied half of the global market will naturally get reduced with the passing of the days in favour of synthetic products.

This is considerably significant, especially at a time when jute once again is being regarded as bio-friendly with a higher re-usage value throughout the globe. According to FAO, it is important that jute producing countries should subscribe to the signals of awareness currently going round in favour of the natural fibre. Even though cost effective in terms of imports, where the per unit price of a jute bag is twice that of a synthetic bag the natural advantages of jute bags are greater than those of the synthetic product. FAO, however, does not rule out the possibility of synthetics still making a fast that import decisions are often made on the short run related especially to price, rather than on long-term considerations.

STRATEGY TO BOOST EXPORTS EVOLVED:

Full benefits to deemed exports sought

Representatives of Indian industry have outlined a seven-point proposal to achieve a breakthrough on the export front.

In a joint statement, the presidents of the three apex chambers of commerce — CII, Assocham and FICCI — called upon the Government to make the rupee fully convertible on the trade account so that higher forex realisation could act as an incentive for exporters.

FICCI's **V.L. Dutt,** Assocham's **N. Sankar** and CII's **J.J. Irani** said that the multi-disciplinary endeavour to boost exports required a level playing-field for Indian industry vis-a-vis their competitors abroad, specially in areas of export finance, infrastructure and export incentives. This would help industry in its effort to achieve an export growth of 15 per cent in dollar terms during the Eighth Plan. "This magnitude of growth is imperative to meet its (industry's) imports and other foreign exchange requirements, including foreign tours and promotion of goods."

The statement pointed out that although the import-export policy (1992-97) has brought in a high degree of flexibility, efficiency and transparency, export growth continues to be stifled owing to the credit squeeze coupled with the high interest on pre-shipment and post-shipment credit, which ranges between 14 and 18 per cent.

Also, the new trade regime provides little incentive to deemed exports, it said, pleading for "the same treatment and convenience to the supplier of deemed exports that are accorded to actual physical exports." Deemed exports cover large areas of supplies in India, including those to projects financed by multilateral funding agencies. Another area inhibiting a full-scale export drive is the state of cargo handling facilities, port management, internal transport facilities and communications. The industry has emphasised the need for concluding trade agreements with CIS countries as well as other East European states to give an impetus to rupee trade, which has gone down drastically.

The statement calls for the active involvement of state governments in the export promotion drive. Since export realisation will hinge on value-added exports, the government should consider a graded incentive scheme. The three chamber chiefs want industry to have a "hard look" on its in-house quality management programmes since only five companies have so far got accreditation under ISO 9000. It is, thus, necessary for the quality cells of CII, Assocham and FICCI to undertake quality upgradation efforts, it added.

PLAN TO BOOST CHEMICAL EXPORTS

Recognising the increasing global trade in chemicals and India's miniscule share, a major export thrust is being given to this sector. The strategy for achieving growth of exports aims at consolidation of our position in existing markets, diversification to new markets and enlargement of product range. The Commerce Ministry has initiated various steps to remove policy constraints on export production as well as to make the products more competitive in the international market.

In order to facilitate export production of agro-chemicals, the Ministry of Agriculture has introduced at the behest of Commerce Ministry a "fast track clearance" of registration applications by the Central Insecticide Board. The Ministry of Finance has proposed to reduce import duty on two pesticides intermediates from the present level of 120 per cent to 65 per cent. In addition, three specified pesticides intermediates have been completely exempted from excise duty. These measures will help the manufacturer-exporters of agro-chemical sector in increasing the export production of pesticides from intermediate level.

Other measures initiated by the Commerce Ministry to boost export of chemicals and allied products are supply of raw materials at international prices, blanket permit scheme to retain some portion of export earnings for use in export promotional activities and inclusion of chemicals in the select list of products for the purpose of payment of higher agency commission to promote exports.

AAKAR ENGINEERING TO MAKE MOULDS

Aakar Engineering and Manufacturing Company Ltd. is setting up a project to manufacture various types of moulds for the plastic industry with total in-house production facilities. The company has received acknowledgement of registration from Ministry of Industry, New Delhi, to manufacture 850 tonnes per year at Nasik. The project cost is about Rs. 6 crore. Plastic industry is rapidly developing in India, but still the consumption of plastic is meagre 10 per cent as compared to that in the developed countries. As per TAGMA's report, the gap between demand and supply of mould is about Rs. 510 crore, which will increase to Rs. 1,500 crore by the turn of the 20th century.

KARNATAKA CHEMSYN TO SET UP BULK DRUG PROJECT

Karnataka Chemsyn Ltd. is setting up a bulk drug project in the joint sector with the Karnataka State Industrial and Investment Development Corporation Ltd. To be set up at a cost of Rs. 4.5 crore, the project will manufacutre ciprofloxacin, ibuprofen, fluoxitine and frusemide. The plant will come up on a nine-acre site at the Jigani Industrial Estate, near Bangalore.

Four-fold rise in fund for SSIs in Eighth Plan

The Government has made a four-fold increase in the allocation for small-scale industries (SSI) development in the Eighth Plan as compared to the Seventh Plan, in view of their vast employment potential, the SSI secretary, **Mr. S.L. Kapur,** said on June 2.

As against the Rs. 427 crores allocated for the development of the small-scale sector in the Seventh Plan, the Eighth Plan's proposed outlay was Rs. 1,709 crores. The outlay had been substantially stepped up as compared to annual plan outlays for the last two years. The outlay was Rs. 102 crores in 1990-91 plan and Rs. 125 crores in 1991-92.

Mr. Kapur said the decision to allow equity participation by other industrial undertakings in the SSI not exceeding 24 per cent of the total share-holding would encourage modernisation and technological upgradation, and also provide a powerful boost to ancillarisation and subcontracting.

He said the decision to widen the scope of the National Equity Fund to cover projects up to Rs. 10 lakh for equity support (up to 15 per cent) and of single window loan scheme to cover projects up to Rs. 20 lakh with a working capital margin of Rs. 10 lakh would help mitigate the credit constraints of tiny enterprises to a great extent.

The shift in emphasis from subsidised or cheap credit towards ensuring adequate flow of credit on a normative basis and the quality of its delivery would facilitate viable operations of the small-scale sector.

He said setting up of a special monitoring agency to oversee that the genuine credit needs of the small-scale sector was fully met, would ensure that the policy objectives were implemented in practice.

The Eighth Plan proposed to generate 24.5 lakh additional jobs in the small sector, to take the total employment in the sector from 126 lakh in 1991-92 to 150.5 lakh by 1996-97, Mr. Kapur added.

The production in the sector was to be stepped up from Rs. 1,60,000 crores in 1991-92 to Rs. 2,33,436 crores in 1996-97, an addition of Rs. 73,436 crores in production in the Eighth Plan.

He said export from the sector was to be increased by Rs. 7,543 crores in the Eighth Plan, from Rs. 12,658 crores in 1991-92 to Rs. 20.201 crores in 1996-97.

Mr. Kapur said the government did not consider it necessary to implement the scheme of Central investment subsidy exclusively for the small-scale sector in rural and backward areas in view of the decision to set up mini-growth centres in backward areas.

Known as integrated infrastructural development, the scheme is to be implemented in 187 identified backward areas at a cost of Rs. five crores each. State governments would provide Rs. 3.5 crores and the Union government Rs. 1.5 for each of the mini-growth centres.

This year the government proposed to set up 20 mini-growth centres and it was expected to set up mini-growth centres in all the 187 backward areas by the end of the Eighth Plan.

Mr. Kapur said the problem of credit to the small-scale sector was a minor one, and a committee had been set up with RBI Deputy Governor **Mr. P.R. Naik** as Chairman. The committee was expected to submit its report soon.

NEW POWER PLANT IN GUJARAT PROPOSED

The Gujarat Electricity Board (GEB) and the Gujarat Mineral Development Corporation (GMDC) have put up a joint proposal before the state government to set up a Rs. 350-crore lignite-based power plant in Gujarat.

The proposal was put to the government recently. Prepared by Tata Consultancy, the proposal for the power project highlights the increasing power needs of Gujarat. The proposed site of the project is Lakhpat Taluka of Kutch district.

Earlier this year, the industries department of the Gujarat had prepared a preliminary report based on lignite availability in Ackimota village of Lakhpat Taluka. GEB found the report feasible, accepted it in principle and had been discussing the same with GMDC authorities.

It is expeected that the 510 lakh metric tonnes availability of lignite will enable the setting up of a 120 mw capacity power plant.

The Gujarat government owns the lignite mines in Akimota Village, and until now has shelved proposals from both the industries department as well as GMDC to allow mining.

Considering the government's attitude so far, some people doubt that the government will clear the power project. More so when one considers that nothing concrete had been done despite the profit-making GMDC announcing many times that it would expand.

Gujarat already has two 70 megawatt capacity lignite-based power plants, both located at Pandadro while a third one, with a 90 megawatt capacity, is also being set at Pandadro.

Proportion of scientists in R & D low in India

India may be proud of having the third-largest pool of scientists and engineers in the world but they are not adequately engaged in research and development, as compared to per million population in Korea, Taiwan, Singapore, Brazil, Mexico, Indonesia and Thailand.

In a publication titled "World Bank support for industrialisation in Korea, India and Malaysia", the UNESCO statistics show that India had only 132 scientists and engineers in R and D per million of the population, compared to 1,426 in Taiwan, 1,283 in Korea, 960 in Singapore, 217 in Mexico, 152 in Indonesia and 150 in Thailand.

In the sample taken by the bank, only Kenya is behind India. Japan, the second economic superpower in the world, has 4,569. "It is apparent", says the publication, "that R and D intensities are strikingly similar to the human capital endowments. Korea and Taiwan have invested heavily in R and D. Korea leads the sample and the whole developing world in total R and D, deflated by GNP. It has also surpassed the OECD countries like Spain, Italy, Austria, Denmark, or Finland".

The publication says that by the turn of the century Korea plans to spend five per cent of GNP on R and D, far exceeding the current levels by Germany, Japan or the United States. Its investments explain how it has attained a competitive edge, largely by national enterprises on a variety of high-technology, large-scale industries.

Taking the productive sector financed by productive enterprises into account, as the best indicator of genuine technological effort by industry, the bank says the amount of R and D financed by productive enterprises is three times that of Taiwan, 19 times that of Brazil or India, nearly 50 times that of Thailand and 380 times that of Mexico. Even the figure of 26 scientists and engineers per million population in Kenya is misleading, says the bank, because the absolute amount is very small, and almost none of it is accounted for by manufacturing industry.

The data on number of scientists and engineers deflated by population, the bank continues, show that the level in Taiwan exceeds that in China and is the same as France's. However, Korea's rate of expansion is more rapid. Both countries' levels are several-fold higher than those of the semi-industrial countries and some 60-70 times higher than that of Kenya.

This measure of the "technical intensity of R and D effort" confirms the extent of the technological lead of the two east Asian NICs (newly industrialising countries). India looks good only when the actual number of science and engineering students is counted, and this is because of her huge population compared to Korea, Taiwan, Hong Kong, Singapore, Brazil, Mexico, Thailand, Indonesia and Kenya. But in percentage she fares badly against most countries. For example, when it comes to the number of engineering students, India has 397,000 students. However, Mexico has 281,800, Korea 227,600, Brazil 164,600, Taiwan 128,700, Indonesia 109,500, Hong Kong 21,100, Singapore 15,400 and Kenya 3,300.

However, it is a totally different story when the percentage of engineers in the population is taken into account. Then the Indian figure is a miserable 0.06 per cent compared to 0.68 per cent in Taiwan, 0.54 per cent in Korea, 0.61 per cent in Singapore, 0.41 per cent in Hong Kong, 0.35 per cent in Mexico, and 0.13 per cent in Brazil. Kenya is the worst with a figure of 0.02 per cent.

Other figures for science and vocational training shows the same trend. The bank says that statistics show that "the east Asian NICs had a relatively strong human capital base at the start of their export-oriented industrialisation drive in the mid-sixties".

Over two decades, the east Asian lead, especially in secondary education, increased dramatically with Korea and Taiwan pulling ahead of the others. Korea, in particular, put out a tremendous spurt in tertiary education, bringing it to OECD levels.

The bank concludes that the figures would suggest that "the four east Asian NICs are best endowed with technical human capital. Of these, Korea has the highest rate of expansion and with Taiwan, probably the largest stock of modern technical skills in place".

Hong Kong has a large inherited stock but is lagging in producing skilled workers and technicians. Thailand has a very small inherited stock but is adding to it rapidly.

Data on firm-level training are not generally available but Korea's policy of enforcing a high investment rate of 5-6 per cent of sales in worker training by firms is likely to be the highest among developing countries.

Singapore has set up several worker training centres to create high-level skills in collaboration with foreign investors. "Its worker training is widely regarded as the best in the world, even in comparison with advanced industrial countries".

K.C. MENON IS CHEMEXCIL CHIEF

Shri. K.C. Menon has taken over charge as Executive Director of the Basic Chemicals, Pharmaceuticals and Cosmetics Export Promotion Council with effect from 25th May 1992.

Changes in Exim policy by July

It is necessary to work out a package of "adequate and attractive" incentives to maximise exports till the trade is completely free and the rupee is made fully convertible, the Minister of State for Commerce, **Mr. P. Chidambaram,** has told exporters.

Addressing an open-house meeting organised by the Federation of Indian Export Organisation (FIEO) at New Delhi on June 1, Mr. Chidambaram said that the Commerce Ministry was closely working in this regard with the ministries of finance and industry.

Mr. Chidambaram also informed the exporters that the Ministry of Finance and Commerce would start an exercise this month on tariff reforms. He favoured early completion of the work so that trade reforms could become really meaningful, he explained.

The government, he said, would come out with the first set of comprehensive amendments in the new Export-Import policy on July 1 which would take care of the many difficulties and grievances highlighted by exporters. He, however, did not elaborate.

The exporters were informed that the pending cases of cash compensatory support (CCS) would be settled expeditiously. A sum of Rs. 18 crores already released has been exhausted. More funds would be released this month and in July, to dispose of other applications, Commerce Ministry officials said.

Mr. Chidambaram said that the government's aim is to provide "stability" in trade policy and amendments would be made when absolutely necessary. Exporters complained of pending cases with the Joint Chief Controller of Imports and Exports, Central Licensing Area, New Delhi. They also highlighted the problem of their being placed at the mercy of the banking sector, particularly the State Bank of India (SBI) in their dealings.

Mr. Kishor K. Shah, president, FIEO, earlier demanded that the government should consider purchase of RPA (rupee-payment area) Exim scrips. He also wanted the Commerce Ministry to reduce substantially the export obligation of 233 per cent for exports to these countries against advance licences.

He suggested that customs duty on imports against Exim scrips/REP licences should be levied at the official exchange rate. This may induce licence holders to use them for imports rather than surrender the same to SBI at a 20 per cent premium, he said.

Moreover, Mr. Shah wanted the government to make applicable the increased threshold limits fixed for export houses, trading and star trading houses from April 1, 1994, which would cover the base period 1991-92, 1992-93 and 1993-94. Alternatively, a transitional period may be provided, as was done in the previous policy when the threshold limit was last raised for renewal of export house certificate from year-to-year basis upon achievement of stipulated export levels, the FIEO chief said.

He also wanted the government to strengthen these professional exporting houses by giving special licences at a rate of 20 per cent of net foreign exchange earnings, subject to a maximum of 20 per cent, for import of any item in the negative list including the canalised items.

INVESTMENT OPPORTUNITIES IN QATAR IDENTIFIED

The Qatar Chamber of Commerce and Industry and PHDCCI have signed 'protocol and cooperation agreement' to identify areas for setting up joint ventures and promote trade relations between Qatar and India. The two Chambers have identified nodal points in their respective countries at the instance of the Qatar Industry Minister, **Mr. Ahmed Ali Al Subaie,** who visited India recently.

The protocol stipulates to encourage and facilitate scientific and technical cooperation, assist in holding of trade and market research missions, conferences, symposia and other methods of trade promotional activity in each other's countries. The areas identified for investment in Qatar particularly in the small and medium enterprises are polyethylene and polypropylene, phosphoric acid, ferro alloys, sponge iron, graphite, electrodes, iron casting, forgings besides aluminium smelters and urea units.

Trade ties with Oman to be strengthened

India and Oman on June 1 decided to set up a joint commission to strengthen their economic and trade cooperation, official sources in Muscat said. This decision was taken at official level talks between the Minister of State for External Affairs, **Mr. Eduardo Faleiro** and his Omani counterpart **Mr. Yusuf Bin Alawi Bin Abdallah** in the Omani capital, the sources said. The commission would be headed by the respective External Affairs Ministers of the two countries.

At present India is ranked seventh among the Sultanate's major trading partners. Imports from India have seen a steady growth of around three per cent totalling $85.78 million last year. Oman's non-oil exports to India more than doubled last year amounting to $12.82 million compared to $5.05 million the year before.

It was also decided to organise a joint seminar on India's new economic policies shortly to improve the investment climate in India. Ministers, Government officials from both countries as well as businessmen and potential investors including non-resident Indians from the whole region would be invited at the seminar.

8th plan targets 7.5 per cent industrial growth

The Eighth Five-Year Plan has targeted the growth in industrial production at 7.5 per cent as against 8.5 per cent achieved in the Seventh Plan period, even as it stresses on achieving efficiency in economy through further deregulation of industrial policy frame-work.

The plan document says the output in the mining and manufacturing sectors during the Eighth Plan period is estimated to grow at 8.12 per cent per annum.

Assigning a growing role for the private sector for sustaining the growth in industrial sector, the document calls for "progressive elimination of protection to domestic industries, particularly in the organised sector, and its ultimate reflection in improved competitive efficiency."

While acknowledging that in recent years, the regulatory apparatus on domestic enterprises has led to widespread inefficiency in the economy in general and the industrial sector in particular, the document says "the thrust of the industrial policy during the Eighth Plan period should be on sustaining the pace of deregulatory measures (that have been initiated in the recent past)."

The Eighth Plan starts against a backdrop of impressive industrial growth during the eighties, a rate which was higher than that achieved by the majority of nations. The overall outlay envisaged in the Eighth Plan for industrial and mineral programmes in the public sector is Rs. 40,911 crores as against the actual expenditure of Rs. 26,295 crores (at current prices) during the Seventh Plan period.

The document says capacity utilisation in the economy improved during the Seventh Plan and also there were good gains in operational efficiency in a number of sectors. While there is much scope for improving operational efficiency, gains in output from better utilisation of existing capacities may not be available in the Eighth Plan, the document warns. This holds particularly in the power generation, rail transport, oil production and mining. Moreover, the stock of instruments in the pipeline today is less than what it was at the commencement of the Seventh Plan.

Project costs in energy and transportation are going up, as the more easily available natural resources have been tapped first and more difficult ones remain to be harnessed. The document, however, says, though the immediate impact of structural adjustment measures will lead to some fall in output, in the medium term, the industry is expected to respond well to the liberalised policies.

The document calls for delicensing of most of the consumer good industries, saying with the recent policy changes, industrial production subject to licensing control has been reduced to about 20 per cent.

Yet some aspects of the new industrial policy seem to be restrictive, it says, adding there are no strong reasons why the production of consumer durables such as motor cars, refrigerators and electronics should be subject to industrial licensing. Also continuation of the licensing for industries like sugar and edible oils has no clear justification.

Along with a liberal policy towards the entry and expansion, for inducing competition and enhancing the efficiency of resource use, the plan advocates freedom of exit, saying "our industrial exit policy is highly restrictive and time consuming."

Stating that this is one of the major factors behind the widespread sickness in industries, both in the public and the private sector, the plan calls for a thorough review of rules and procedures

regarding the exit policy to make it much easier for any economically unviable firm to close down. At the same time, a key consideration in evolving a practical industrial exit policy should be that it should protect the legitimate interests of labour, whether in the public or in the private sectors.

To minimise the adverse effects of closure on labour, options like introduction of compulsory insurance or creation of a fund to pay retrenchment benefits to employees should be tried.

The plan, however, warns that the benefits of proposed rationalisation and relaxation of entry and exit policy will be somewhat reduced if the government continues to administer prices and the distribution of various industrial products.

Therefore, the plan calls for a thorough review of the usefulness of these price controls, and says wherever the product concerned is internationally tradeable, the government should decontrol prices.

At the same time the tariff rates on the import of these products should be suitably adjusted downwards, as had recently been done in the case of steel, for ensuring that such price decontrols do not allow the existing producers to hike prices and hence enjoy "rents".

Without such a supportive tariff adjustment, decontrol of hitherto administered prices may lead to unreasonable increase in the prices, thereby hurting the consumers.

In the case of non-tradeable goods, like electricity, and public transportation, in which the state sector has a near monopoly, the document says, the base level of prices should be fixed after detailed studies of costs on a normative level of efficiency. After this changes arising from increases in input costs should be made automatic.

For maximising the domestic capacity utilisation, the document stresses on prudent planning for imports to meet the fluctuating component of the demand, even in the case of commodities where domestic production has a strong base.

Another area needing a thorough examination relates to small scale industries, the document says, adding that one of the major problems with this sector has been the lack of adequate modernisation and technological upgradation.

Even though this sector has helped to achieve a reasonable growth in industrial employment, while occupying a unique place in a strategy of labour-intensive industrial growth, the document stresses on the need for modernisation and upgradation of technology in this sector.

Only by taking advantage of the technological changes that are taking place in the present day world, can the sector compete effectively with the larger industrial units.

Nonetheless, the plan calls for fair measures of protection to village and small industries for a few years, as it feels that the indigenous technology cannot immediately adjust to the international levels particularly in this sector.

On the role of public sector, the plan says there are some notable weaknesses, the most important being the inability of the public sector to generate adequate resources for sustaining the growth, despite its creditable share in the self-reliant growth of the economy so far.

Therefore, it calls for a review of the role of public and private sectors in order to enable them to jointly shoulder the responsibility for further development of the economy.

NMDC setting up 250-cr. project in Himachal Pradesh

The National Mineral Development Corporation (NMDC) will set up a Rs. 250-crore low silica limestone project in Solan district of Himachal Pradesh to meet the increasing silica limestone requirements of the steel industry.

Himachal Pradesh Industries Minister **Mr. Kishori Lal** said in Shimla recently that the state government had granted mining lease over 238 hectares on Arki Hills in Solan district to the NMDC for mining limestone. The project will provide employment to about 2,000 people and save considerable foreign exchange by way of reducing import of limestone.

He said the country's demand for the low silica limestone was expected to increase from the present two million tonnes per year to six million tonnes by the turn of the century. The low silica limestone was used as flux in the basic oxygen forgnances (bof) process of steel-making, he added. Mr. Kishori Lal said the Union Government had accorded stage-one clearance to the Arki project and sanctioned Rs. 2 crore to carry out a feasibility study and prepare a detailed project report and an environmental impact assessment and environmental management plan. He said the mining plan had been approved by the Indian Bureau of Mines. Successful execution of the project would serve as a model for opening mines in other similar environment areas, he said. The project was slated to be executed in four years from the date of its sanction, he said. Deposits of low silica limestone at Arki are estimated at 169.2 million tonnes calculated reserve, 152.5 million tonnes geological reserves and 128.6 million tonnes mined reserves. The quality of reserves is considered good for use in steel plants and chemical industry, according to the project report. Mr. Kishori Lal said mining of limestone would be carried out in the mining lease area. Only primary crushing and minimum service facilities were envisaged at the top of the view of environmental considerations.

He said the crushed material would be transported to Souri village in Nalagarh tehsil of Solan district, through belt conveyors to a ground bin outside the mine limit. The bottom of the bin (30 to 40 metres high) would open into a tunnel from where the material would be loaded into aerial ropeway buckets for transport to the Souri plant site through a 35-km ropeway.

He said a secondary crushing screening plant was proposed to be set up at Souri where the primary crushed limestone would be further crushed and screened to obtain the required sized fractions. Mr. Kishori Lal said various sized fractions would be stock-piled separately at Souri and a railway loading yard was proposed to be set up nearby. He said the Northern Railway had agreed to provide a private siding near Souri for the project. A survey of the 0.2-km-long track for siding had been completed and estimates for it would be available shortly, he added.

Separate townships have been envisaged for employees to reside near the work spots. One township is proposed to be set up near Bhakalagh village, eight km. from Arki town, where about 250 residential units will be constructed. Another township is proposed near Souri village where 150 residential units for employees working at the screening and loading plants will be set up.

ENVIRONMENT BRIGADES TO BE SET UP SOON

A new scheme called 'Paryavaran Vahini' (environment brigades) is being launched by the Environment Ministry. Environment Minister **Mr. Kamal Nath**, has written to the Chief Ministers of all states seeking their coopera[tion] in implementing the scheme. In th[e] first year, about 100 *vahinis* will be se[t] up, one in a district. The emphasis wil[l] be on districts having either high inci[dence] of industrial pollution or densit[y] of forests and tribal population, or a combination of these. It is proposed tha[t] the number of environment brigades will be gradually increased every yea[r] in order to cover the entire country during the Eighth Plan period. The scheme has been conceived with the objective of:

* Creating environmental awareness and involvement of people, especially youth, in population control through active participation.

* Reporting of illegal acts pertaining to forests, wildlife, pollution and environmental degradation.

* Feedback regarding afforestation by Forest Department and survival of plants.

* Monitoring, including collection of sample, analysis of ambient air and water quality, including vehicular pollution.

The membership of each vahini will be restricted to 20 to begin with and thereafter this could be enlarged upto 100. A total expenditure of Rs. 5 crore is envisaged during the Eighth Plan.

LUBRIZOL TIES UP TECH FOR ISOBUTYLENE

Lubrizol India Ltd., a joint venture between Lubrizol Corporation and the Union government, has recently entered into a license agreement with Snamprogetti SPA, the engineering company of the Italian state-owned ENI group, to use the Snamprogetti process for the production of high purity isobutylene by cracking of methyl tertiary butyl ether. Snamprogetti is well known as a pioneer in the field of MTBE. It has also pioneered the technology for MTBE cracking which enables production of isobutylene with purities.

IISCO update plan may begin by August

The Rs. 6,520-crore modernisation programme for the Indian Iron and Steel Company at Burnpur may begin latest by August end, as per the assurance held out by the Ministry of Steel to the parliamentary committee on government assurances.

The final decision may be taken even earlier provided the SBI Capital Markets (SBI CAPs), assigned to explore the possibility of private equity participation in IISCO modernisation, submits its report. In that case, a decision on modernisation could be expected in June.

The ministry in its submission to the committee has stated that the possibility of private equity participation was looked into but nothing has concretised so far. SBI CAPs has been entrusted the job to find out ways and means of such equity participation.

According to the managing director of IISCO, the question of private equity participation was an overall policy decision. Regardless of such participation, both the Steel Authority of India as well as the Steel Ministry were committed to modernisation of IISCO. The Steel Ministry, however, made it clear that if the SBI CAPs report failed to come through, the Ministry would take up the modernisation plan in "convenient modules" and the take-off date of execution of this "modular approach" could be by the end of August this year.

It is to be noted that SAIL has already submitted a proposal outlining the funding pattern for IISCO modernisation and if it is okayed by the government, SAIL would not require any budgetary support.

SAIL has also tried to drive home the point that it should be allowed to operate outside the purview of the Joint Plant Committee which fixes the pricing structure for iron and steel as this would allow SAIL to mobilise resources for managing the forthcoming projects, particuarly IISCO.

Interestingly, the SAIL views on funding IISCO modernisation are contradictory. While on one hand SAIL says that it does not require any budgetary support, subject to however, the government acceptance of the SAIL fund proposal, on the other, in the status note, it says that none of modernisation proposals could be implemented owing to paucity of funds.

The parliamentary committee, however, was "totally dissatisfied" with the arguments put forth by the Ministry. While referring to the resource mobilisation options for IISCO modernisation, the Steel Ministry has clarified that a model of external suppliers' financing had been developed only recently, from the experience gained by inviting tenders for Durgapur and Rourkela Steel Plants modernisation package.

Whatever may be the funding arrangement, the Steel Ministry secretary underlines that the government is "unequivocally" committed to the modernisation plan. The funding proposal was put up to the Public Investment Board (PIB) on December 26, 1991, which was cleared subject to obtaining environmental clearance and exploring the possibilities of private funding. Accordingly, SBI CAPs was assigned the task of exnloring the possibilities of private equity participation.

In reply to the committee's query as to why the delay in taking a decision on IISCO modernisation, the Steel Ministry had said that so far, there was no viable proposal from SAIL for the modernisation plan. The report submitted by the Japanese was not considered mainly because of low rate of return on the investment and unsatisfactory product mix. It was only after the cost-reduction study proposal submitted by Dastur and Co. that a viable proposal had been worked out by SAIL and based on this PIB held the discussion on December 26, 1991. However, the parliamentary committee differs on the position as stated by the Ministry. MECON prepared the first modrnisation proposal in 1974. This was followed by another proposal by the Soviets ten years later. The Japanese came into the picture in 1987. "It was, therefore, not correct to say that the Ministry had no proposal for the modernisation of IISCO", according to a committee member.

The delay, according to the committee, had been on account of "administrative wrangles" resulting in cost escalation, defeating the very purpose of cost reduction exercises done earlier by SAIL and the Ministry.

After weathering rough and stormy days, IISCO, is today poised to reach a no-cash loss situation and is expected to make marginal profits for the first time since its takeover. The committee observes that Burnpur Works is the most ideally located steel plant in the country with a dedicated and trained workforce having a unique work culture of its own. Three-fourths of the preliminary work has been completed and engineering and technical data are available.

"The time is most opportune and IISCO is all set for modernisation", the committee feels. It is against this backdrop that the committee has strongly recommended speedy clearance of the modernisation proposal.

The committee has also urged the Ministry to consider the proposed "modular approach" in case the modernisation plan is not cleared. It has directed the Ministry to furnish a position paper on the subject in the light of the committee's observations.

RAMU S. DEORA
Chairman

SAIL achieves record production in May

The five public sector steel plants under the Steel Authority of India Ltd. (SAIL) produced 644,000 tonnes of saleable steel during May this year, which was nine per cent higher as compared to the corresponding month last year.

The plants also produced 846,000 tonnes of hot metal and 771,000 tonnes of crude steel which too were higher by six per cent and seven per cent respectively as against the output in May 1991.

Along with steel, the power generation at the captive power plants of SAIL has also increased. The plants generated 464 mw during May which was 4.3 per cent higher than that in the corresponding period last year, says a SAIL press release.

The SAIL plants at Bhilai, Durgapur, Bokaro, Rourkela and IISCO have achieved the targets set for the current financial year. The cumulative production of hot metal, crude steel and saleable steel at the SAIL plants during April-May this year has been higher by five per cent, six per cent and three per cent as against last year.

There was an appreciable growth during May in the output of wire rods, heavy structurals and light structurals which grew by 39 per cent, 13 per cent and 30 per cent respectively. The output of plates, HR coils/skelp, HR sheets, CR coils/sheets and GP/GC sheets rose by 23 per cent, 22 per cent, 23 per cent, 18 per cent and 16 per cent respectively over that of May. The CRNO electrical sheets and tin mill black plate (TMBP) coil production doubled as compared to the same period last year.

Bhilai produced 316,000 tonnes of hot metal, 310,000 tonnes of crude steel and 244,000 tonnes of saleable steel, registering a growth of 24 per cent, 20 per cent and 12 per cent respectively compared to the corresponding period last year and achieved the targets in all the three items. Incidentally this was the best May production since inception. Bokaro also recorded its best May production of hot metal (312,000 tonnes), crude steel (288,000 tonnes) and saleable steel (242,000 tonnes). It registered a growth of 12 per cent in hot metal, nine per cent in crude steel and 11 per cent in saleable steel production compared to May last year.

The Durgapur plant produced 55,000 tonnes of hot metal, 53,000 tonnes of crude steel and 46,000 tonnes of saleable steel. It exported 22 million units of electricity to the regional grid, after meeting the requirement of the steel plant and assisting Alloy Steel Plant.

Rourkela produced 94,000 tonnes of hot metal, 90,000 tonnes of crude steel and 82,000 tonnes of saleable steel, registering a growth of 20 per cent in saleable steel, thus achieving all targets in three segments.

The Burnpur Works of IISCO produced 69,000 tonnes of hot metal, 30,000 tonnes of crude steel and 30,000 tonnes of saleable steel.

Alloy Steel Plant produced 18,500 tonnes of liquid steel and 13,000 tonnes of saleable steel, registering a growth of 13 per cent and 32 per cent respectively. The plant achieved all its targets.

Salem Steel Plant produced 2,561 tonnes of stainless steel coils/sheets in May as per plan.

TISCO TO BENEFIT MORE FROM PRICE HIKE THAN SAIL

The recent hike in steel prices by Steel Authority of India Limited (SAIL) will offset the input cost which has gone up since September 1990. SAIL revised its prices upward only from May 18, this year.

Mr. R. Jambunathan, Director (finance) of SAIL, said that the hike would help check in erosion in internal generation of the company and impact on the profitability would be marginal. He said that profitability would improve only with increase in production and containing the cost of production.

Additional generation from price hike would offset increase in the prices of coal, power tariff and stores and spares, he said. Stores and spares account for 14-15 per cent of SAIL's cost of production.

Tata Iron and Steel Company Limited (TISCO) is likely to benefit more from price hike since it does not buy coal from Coal India Ltd (CIL). TISCO has its own captive coal and iron ore mines whose quality is better than what is supplied by CIL. Its requirement of imported coal is 10-15 per cent. TISCO also has a captive power plant. Its internal generation on account of price hike is expected to improve by 50 per cent.

TISCO has kept its prices higher than what has been fixed by SAIL. Priority sector customers like railways, defence and other sectors would prefer to buy their requirements from SAIL instead of TISCO since the prices charged by former are lower even after the hike. Moreover, TISCO's major chunk of production is earmarked for captive consumption for other sister units.

Mr. Jambunathan said that SAIL's profitability is further constrained by the fact that it has to produce over eight lakh tonnes of pig iron. There is no value addition in producing pig iron. Moreover, cost of production of pig iron does not cover the cost of production even after the increase in prices of pig iron. SAIL has to import 25-30 per cent of its total coal requirement.

Devaluation of rupee in July last year and partial convertibility of the rupee this year has made import of coal much costlier for the company.

POWER GENERATION:

BHEL seeks tie-ups with private firms

In a bid to improve its order book position, Bharat Heavy Electricals Limited (BHEL), is now seeking collaborations with private firms for entering power generation areas. The public sector is also seeking similar financial collaborations with several state electricity boards (SEBs) as also other heavy industry public sector undertakings, to jointly bid and execute power projects all over the country.

Disclosing this to *'The Economic Times'*, **Mr. A. Gavisiddappa,** Chairman and Managing Director of BHEL, said "since the government has now allowed private sector participation in power sector, we have taken this opportunity to work out a financial collaboration with them". Mr. Gavisiddappa, assumed office as the new Chairman and Managing Director of BHEL in New Delhi recently.

Describing the moves to tailor out new collaborations as a new marketing strategy, he said since funding was a major problem in power sector, companies in public and private sector would have to jointly pool in their resources to be competitive both in terms of price and quality. The BHEL CMD felt that the top most priority area at present was to bag as many orders as possible. Over 8,000 MW of power have yet to be created, ordered and we are all waiting to have our share.

"While orders for execution of over 23,000 MW of power in the Eighth Plan had already been issued, a total of 31,000 MW of power is estimated to be created during this Plan period. BHEL has so far bagged orders for creation of only 9,000 MW of power.

The public sector company, however, has now initiated efforts to work out these collaborations and discussions have been held with several private firms keen to enter power sector. Also, the utilities have also been approached, to assess the feasibility of such collaborations.

BHEL has already identified gas based power stations as the first specific area wherein it would be working in collaboration with a private firm under a financial arrangement to execute the project. While an arrangement to this effect has already been worked out with Gujarat Power Corporation, several such collaborations were in the offing.

While details of the financial arrangement would vary on the basis of the company and the project to be executed, BHEL is keen to work out in favour of a deferred credit package involving a provision for the suppliers credit.

In regard to working in unison with other public sector undertakings under the Ministry of Heavy Industry, a memorandum of understanding (MoU) has already been signed with Bharat Yantra Nigam Limited (BYNL) to form a consortium to jointly bid and implement power projects on a turnkey basis up to a capacity of 200 MW. The consortium will make bids and implement power projects including those that have to be financed, operated and maintained by the consortium on the basis of supply of energy at an agreed tariff.

Giving details about the industry sector and new business areas of the company, Mr. Gavisiddappa, disclosed that BHEL's prospects in the industrial sector were largely dependant on certain policy decisions on defence and transportation. According to him, the company had made a large number of proposals to take up the manufacture of certain high value defence items.

BHEL has also carried out detailed work on various alternatives for mass rapid urban transit systems.

India to raise $4 billion for power sector

In its first major effort at attracting direct foreign investment, India hopes to raise at least four billion dollars (Rs. 12,000 crore) abroad shortly to raise the country's power generation by about 4,000 MW to meet its energy requirments during the Eighth Plan.

Cabinet secretary **Mr. Naresh Chandra,** who headed a delegation to the US recently has indicated that private American power corporations had responded well to the idea of participating in joint power projects in India which offered liberal terms and a return of at least 16 per cent on their equity.

Another attraction for the foreign companies was the possibility of 100 per cent equity participation in power projects and delinking the profit repatriation from export commitments as had been the rule in other joint ventures, he added. Power secretary **Mr. S. Rajagopal** said power utilities companies in the US appeared keen on having a presence in India following reports of economic reforms there.

The delegation also held discussions with senior officials in the World Bank and its private sector arm, the International Finance Corporation (IFC). Since the World Bank deals with governments, it could only help the prospective investors in providing an understanding of the Indian economy. But India wants the IFC to play a catalytic role in securing foreign capital for it.

Mr. Chandra listed the advantages of the foreign investment in power sector. These included: Availability of enormous capital and interaction with some of the most advanced corporations in the power sector in the world which would bring latest technologies and attendant techniques. Mr. Rajgopal said the hope for the four billion dollars foreign investment was based on memorandam of understanding (MoU) already signed and other projects currently under consideration. Some 70 per cent of the financing would be raised by the companies in the US and the balance in India, he added.

Mr. Chandra said many corporations had come with specific proposals most of which would soon reach a stage of fruition. Commitments were there from the companies in the US and the United Kingdom, which the delegation had visited before arriving to Washington, he added.

Some of the US companies sought clarifications regarding the sale of power they generated and about the payments by customers and repatriation of profits and dividends. In addition to the US and the UK, the delegation said that Seimens in Germany, Mitsubishi in Japan and some Italian companies had shown interest in investing in India.

Environmental revolution urged to save planet

In his recent report, State of the World 1992, the Director of the US-based Worldwatch Institute, **Dr. Lester R. Brown** has appealed for an "environmental revolution" to save the planet from ecological disaster. According to him, if humanity has to survive, business managers and public administrators must change their perception towards the environment " as a boundless cornucopia to be enjoyed, plundered and rear-ranged for profit". This demands a strategy for the management of the environment that would promote the welfare of society.

In this context, two aspects deserve urgent attention: environmental pollution and depletion of natural resources. Although they are inter-related, managements of business houses tend to perceive one to the exclusion of the other. This has led to lop-sided development and inequitable exploitation of economic resources.

The resources may be "renewable" as in the case of timber and fish stock, or "non-renewable", such as fossil fuels. The environment also provides for "natural goods" — the landscape, scenic views, forest tract and life suporting systems. It is by optimising the rate and extent of exploitation that the quality of life on earth can be improved.

The interaction of industrial units with the environment also takes place when hazardous chemicals and waste products are so released that they pollute the atmosphere, soil, rivers and streams. The problem before industrial managements is therefore such pollution can be controlled, and if so, at what cost?

Furthermore, who will bear these costs? Can the costs be transferred to the end consumer or should a part be borne by the concern itself? In other words, a modern manager has to strike a balance between the cost of enforcing pollution control measures on the one-hand and the value of social benefits that can be derived from them on the other. Valuation of the latter type is a complicated exercise, and business houses invariably fail to make a correct assessment on this count.

The issue is one of ethics. An answer has to be found to whether the price society pays for generation of wealth (through industrial development) is ultimately worthwhile. How can a "private cost" paid by the manufacturer or management for maintaining zero-level environmental pollution be reconciled with the public or "social cost" of human suffering and collapse of life supporting systems?

It has been rightly stated by social scientists: "In environmental matters, there are many examples of divergence between private and social costs. The atmosphere may be polluted at zero private cost, while the social costs can be prohibitively high — from extra cleaning bills and chest diseases to damages caused to the ozone layer and unknown medical complications".

For instance, the use of chemical fertilisers gives business houses the private advantage of improved crop yields and the costs resulting from the accumulation of chemical compounds will be borne by others possibly far apart in distance and even generations apart in time. This is just one instance of how invisible factors (in terms of per unit costs) can raise social costs through the indifference of modern business managements.

In case a management does bother about such invisible factors, the immediate temptation would be to work out a "social cost-private benefit" ratio. These are, however, matters that defy accurate computation. It is just not possible to assign a monetary value to human life or to suffering caused by environmental degradation. Similarly, no accountant has yet devised a method of costing of health and comfort.

Currently many business units are incurring what is known as "environmental costs", but even they are not properly recorded. In some cases, companies pollute the environment despite provision being made in their budget for anti-pollution measures. This is due to sheer irresponsibility and carelessness on their part, for which society pays a heavy price. After all, all costs including "environmental costs" are incorporated in the price of products.

It is therefore time that modern managers are briefed on the basics of environmental audit. The concept has got to be promoted as an important part of management having a bearing on environmental performance. A procedure needs to be evolved for regular preparation of a balance-sheet in this regard and periodical review performance.

Managements should also effect modifications in products, processes and raw materials, where necessary for environmental reasons. The latest report of the Business Council for Sustainable Development (BCSD) incorporates 40 case studies of corporate units which have undertaken such modifications, achieving a fair degree of success. These success stories ought to be examined by professional managers for application in other companies. In this context, the Indian delegation to a recent international conference on environmental conservation at Nairobi presented a blueprint for developed countries of the West to bear the financial burden of pollution abatement measures. It stated *interalia:* "Those countries that have achieved their current levels of affluence by improvident exploitation of natural resources in the past and today dominate the global economy must bear the cost of environmental restoration'.

Highlights in Chemical Technology

HEATED MEMBRANES GIVE IMPROVED SEPARATION

Pervaporation with membranes has now acquired an additional capability. With electrically heated membrane surfaces, it is now possible to better control temperature gradients. Karl W. Boddeker, a research chemist with GKSS Research Center, in Geesthacht, Germany, described his unique heated membrane for the Division of Industrial & Engineering Chemistry.

High-boiling organic solutes are selectively removed from dilute aqueous solutions, and thereby enriched, by pervaporation through elastomeric (hydrophobic) polymer membranes. The selectivity for those components with high-activity coefficients is manifested in the membrane by preferential sorption of the organics in the polymer, which fosters swelling of the membrane.

The organic solutes considered by Boddeker are phenol and 4-hydroxydecanoic acid lactone. The membrane is a segmented-elastomeric polyether-amide-block-copolymer (PEBA). The permeability of the PEBA membranes for organic solutes is highly insensitive to barrier thickness, but the permeability to water decreases markedly with thickness. This suggests that thick membranes will enhance selectivity, and has been demonstrated in the case of phenol/water separation, where phenol enrichment occurs by a factor of 100 for PEBA membrane thickness between 50 and 100 µm.

Increasing the organic concentration causes increased swelling and destabilizes the membrane. This can be combated by incorporating a woven fabric near the permeate side of thick polymer membranes. Suitable woven fabrics include synthetic cloth (polyesters and polyamides), glass fiber mats, and metal wire mesh. If a wire mesh is used, the additional possibility exists for electrically heating the mesh.

Such a pervaporation apparatus was made with a heated stainless-steel wire cloth, with wire 50 µm in diameter and with a 71% open area. The membrane was an asymmetrically cast PEBA material with an equivalent thickness of 112 µm — that is, the same thickness that would be obtained by the same polymer with reinforcement. The entire apparatus was thermostated, and power was supplied from a direct current generator providing a power density of 0 to 0.5 watt per sq. cm. of membrane area.

In general, the permeation rates increased with the supply of heat, but the rate of the high-boiling organic increased more rapidly, thereby providing greater separation. There is a limit to the increase in separation with heating.

In a conventional pervaporation cell, the feed is the only carrier of heat, thus defining the initial temperature and the compensated heat loss resulting from evaporation of the permeants. In the case of water/phenol separation, the organic flux density increases with temperature, but the separation effect decreases. This is quite different from the effect with the heated membrane.

The difference is believed to be related to the temperature gradient across the membrane. In a conventional membrane, the permeate side of the membrane is at a lower temperature than the feed side, and the temperature gradient follows the swelling gradient. When heat is applied to the permeate side, that side is at a higher temperature, and the temperature gradient "counterbalances" the swelling gradient. This affects the diffusional mobility of the permeants, with organic permeants generally less mobile than water. (*C & EN* 27 April 1992).

OZONE LOSS OFFSETS GLOBAL WARMING FROM CFCs

Ozone depletion in the stratosphere caused by chlorofluorocarbons (CFCs) is cooling some regions of the atmosphere, counterbalancing the direct global warming effect of CFCs, according to V. Ramaswamy and coworkers at Princeton University's atmospheric and oceanic sciences program. The idea that the direct and indirect effects of CFCs on climate may oppose each other was first discussed by the same researchers in a 1991 United Nations report, but their work is just now appearing in a peer-reviewed journal [*Nature*, **355,** 810 (1992)]. The researchers calculate that decreases in ozone, which absorbs sunlight, have led to lower temperatures in the stratosphere — a finding that has been confirmed by observations. That cooling, in turn, is calculated to lead to cooling in the troposphere. Averaged over the entire Earth, the cooling from ozone loss almost completely offsets the calculated greenhouse warming from CFCs. At higher latitudes, where ozone depletion is greatest, the cooling may even exceed the CFC warming. The researchers caution that more work is needed to understand complications but they conclude the net global warming effect of CFCs is likely much less than previously thought. (*C & EN* 2nd March 1992)

MoO_3 THIN FILM CHANGES COLOR IN VISIBLE LIGHT

Japanese researchers have found a way to treat a thin film of molybdenum trioxide (MoO_3) so that it changes

color reversibly when exposed to visible light [*Nature*, 355, 624 (1992)]. A stable, reusable film of such a photochromic material could be used, for example, in optical displays and high-density memories. Some transition-metal oxides change color in response to ultraviolet light. But sensitivity to visible light is a prerequisite for many applications, including those involving common semiconductor lasers. Chemistry professor Akira Fujishima and coworkers J.N. Yao and K. Hashimoto of the University of Tokyo prepare amorphous, colorless films of MoO_3 by vacuum evaporation of the powder. Electrolytic pretreatment of the film (cathodic polarization) gives it a slight bluish tint and makes its sensitive to visible light. When light is then shone on the film, it turns deep blue. The color is reported to be very stable in films exposed to air for many months. Anodic polarization can be used to remove the film's color. The film can be repeatedly colored and decolored in this way, but some residual color must remain in the film for it to be light-sensitive. (*C & EN* 17 February 1992).

HPCL COLUMNS PACKED BY IN-SITU POLYMERIZATION

A convenient, reproducible technique to pack columns by in-situ polymerization for high-performance liquid chromatography has been developed by chemists at Cornell University, Ithaca, N.Y. [*Anal. Chem.*, **54**, 820 (1992)]. Chemistry professors Jean M.J. Frechet of Cornell and Frantisek Svec, on leave from the Czechoslovak Academy of Sciences in Prague, combined glycidyl methacrylate and ethylene dimethacrylate monomers, cyclohexanol and dodecanol solvents, and 2,2'-azobisisobutyronitrile polymerization catalyst in the column tube, which they heated to cure the resin. They then pumped methanol through the column to wash out solvents and other solubles. The cyclohexanol and dodecanol acted to form molecule-sized cavities in the resin, thus rendering it microporous. (*C & EN* 6 April 1992).

NMR TECHNIQUE PROVIDES 3-D IMAGES OF RIGID POLYMERS

Proton nuclear magnetic resonance has been used for the first time to obtain three-dimensional, spatially resolved NMR images of rigid polymers. Several techniques for proton NMR imaging of solids have been demonstrated previously, but these involved linear (one dimensional) or planar (two-dimensional) imaging. Spatial discrimination in the third dimension has been difficult to achieve because of the short spin-spin relaxation times of protons in solids. These cause wide NMR spectral line widths that preclude high-resolution spatial encoding by conventional imaging methods. Now, S.L. Dieckman, N. Gopalsami, and R.E. Botto of Argonne National Laboratory; P. Rizo of France's Atomic Energy Commission in Grenoble; and J.P. Heeschen of Dow Chemical Co. have developed an imaging technique based on multipulse homonuclear docupling [*J. Am. Chem. Soc.*, **114,** 2717 (1992)]. The technique, which allows 3-D images to be acquired with increased resolution by reducing the line widths considerably, is demonstrated by 3-D mapping of proton density in a cylindrical polycarbonate specimen. The 3-D image accurately reproduces the specimen's major features, including a hole through the middle. According to Dieckman, it may be possible to extend the technique to mappings based on other NMR parameters (such as spin lattice relaxation times) and other nuclei (besides protons). (*C & EN* 6 April 1992).

COPOLYMER DIODES EMIT COLORS, GLOW BRIGHTER

Scientists have taken another significant step toward the realization of practical polymer-based electronic devices. A team at the University of Cambridge, England, reported last week that organic copolymer films can be chemically "tuned" to emit light of specific colors when stimulated by an electric current [*Nature*, **356**, 47 (1992)]. The work eventually may lead to multicolored, flat-screen electronic displays based on organic semiconductors. Chemists Andrew B. Holmes, Paul L. Burn, and Arno Kraft prepared block copolymers derived from poly(*p*- phenylenevinylene) (PPV) that consist of randomly alternating conjugated and non-conjugated sequences. These sequences mimic the electronic structure of certain inorganic semiconductor quantum wells, which confine excitons (electron-hole pairs) and allow control over the color of the light emitted by them. With their physics colleagues Richard H. Friend and Donal D.C. Bradley, they found that the copolymers, when fashioned into a light-emitting diode (LED), produced more light than an earlier-generation LED based on homopolymeric PPV that emitted only yellow-green light. In fact, the researchers state that the emission efficiency of such copolymer-based devices "can be raised to levels comparable to those of inorganic devices operating in the yellow-green part of the spectrum." Furthermore, the color of the emitted light can be varied from green-blue to orange-red by controlling the chemistry of the copolymerization and the degree of conjugation. The films also can be patterned to give regions of two different colors, and this allows the fabrication of optical wave guides. (*C & EN* 9 March 1992)

STM TIP DISSOCIATES INDIVIDUAL MOLECULES

The repertoire of the scanning tunneling microscope (STM) continues to expand. It has been used, for example, to draw molecular-sized markings on a surface and to transport atoms and molecules from one site to another. Now, researchers have used the STM to break apart a specific molecule adsorbed on a surface and examine its dissociation

products [*Science*, **255**, 1232 (1992)]. Chemist Phaedon Avouris and physicist Robert E. Walkup of IBM's Thomas J. Watson Research Center in Yorktown Heights, N.Y., and physicist Gerald Dujardin, now at the University of Paris-South, Orsay, France, demonstrated these new capabilities using decaborane(14) ($B_{10}H_{14}$) molecules adsorbed on a silicon surface. They first imaged the molecules directly using the STM. Then, by increasing the voltage and moving the STM tip over the target molecule, they used the stream of low-energy electrons from the tip to decompose the molecule. Although they can tell the molecule has fallen apart, they cannot determine what the products are. Avouris says such a selective dissociation process could be used to control surface chemistry on a molecular scale — for example, to dope a silicon nanostructure locally with boron or other aotms. (*C & EN* 9 March 1992).

NEW SYNTHESIS DEVISED FOR PEROXY COMPOUNDS

Chemists at the University of Nebraska, Lincoln, say 1-methoxyprop-2-yl hydroperoxide is a useful reagent to make hydroperoxides and peracids [*J. Org. Chem.*, **57**, 1009 (1992)]. Naturally occurring hydroperoxides are active against cancer, bacteria, and parasites. Organic chemistry professor Patrick H. Dussault and graduate student Ayman Sahli make the reagent by ozonolysis of 2,3-dimethly-2-butene in methanol. Treating the reagent with primary alkyl bromides produces acetone alkylmethylperketals, which acetic acid cleaves to alkyl hydroperoxides in good yields. Yields from secondary halides are low, but (*S*)-2-bromooctane does give a 20% overall yield of (*R*)-2-octyl hydroperoxide. Reaction with acids produces 2-methylprop-2-yl peresters, which acetic acid cleaves to peracids in good yields. The method is mild enough to make *trans*-percinnamic acid, though in 35% overall yield. Organic chemistry professor Isao Saito of Kyoto University, Japan, reported making peracids with a similar "protected hydrogen peroxide" reagent in 1990. (*C & EN* 10 February 1992)

GASOLINE ALKYLATION PROCESS TO BE COMMERCIALIZED

Commercial development of a new catalytic gasoline alkylation process will be pursued by a joint venture of Catalytica, Du Pont energy subsidary Conoco, and Finnish oil company Neste Oy. The process, devised by Catalytica and based on a proprietary solid catalyst, would replace the need for liquid acid catalyst alkylation units that use hydrofluoric or sulfuric acids to produce high-octane gasoline. Existing liquid acid alkylation units could be converted to the new solid catalyst-based process, Catalytica says. The three partners plan to have a pilot plant operational at Neste's Porvoo research center in Finland this fall. "We believe this process is a major step forward toward meeting the growing demand for cleaner, more environmentally compatible motor fuels, while simultaneously allowing reductions in on-site liquid acid inventories," says Paul Lashbrooke, Conoco vice president for refining and research and engineering. (*C & EN* 10 February 1992).

POLLUTION PREVENTION IS GOAL OF NEW RESEARCH CENTER

Developing new pollution prevention technologies is the aim of a new university-industry cooperative research center at New Jersey Institute of Technology, Newark. The Air Emission Reduction Center (AERC) — first of its type in the Northeast, according to UJIT — will operate as a consortium led by NJIT and including Massachusetts Institute of Technology, Ohio State University, and Pennsylvania State University. Nine organizations have secured memberships so far — American Cyanamid (Lederle), Ciba-Geigy, Eastman Kodak, Hoffmann-LaRoche, Merck, Pfizer, Sandoz, Smith-Kline Beecham, and the Army through Picatinny Arsenal. Funding support has been committed by EPA, NSF, and the New Jersey Commission on Science & Technology, bringing the initial budget to $1.2 million. AERC will begin by focusing on the pharmaceutical and specialty chemicals industries. After these initial efforts are under way, it will work on reduction technologies for petroleum and bulk chemical manufacturers, gas and electric utilities, the electronics industry, and steel manufacturers. (*C & EN* 27 April 1992).

STRATEGY IDENTIFIES NEW CHEMICAL REACTIONS

A problem-solving strategy has been developed to "discover" chemical reactions that in the past may have escaped chemists' notice. Rainer Herges and Christoph Hoock of the University of Erlangen-Numberg, Germany, find that graph theory can be used to screen for new organic reactions, a technique they call "reaction planning" [*Science*, **255**, 711 (1992)]. They illustrate the approach with a systematic screening of all possible pericyclic reactions meeting certain constraints, the purpose being to find new reactions for the synthesis of conjugated dienes. A screen of 72 possible reaction schemes yielded two previously unreported reactions. These were optimized with the aid of quantum chemical calculations and then verified experimentally. One of the reactions, which was found to generate butadiene in yields greater than 95%, "is probably superior to alternative methods," the researchers say. The second reaction, which gives butadiene in 40% yield, is less advantageous. "Compared to other rational approaches in chemistry, such as molecular modeling or synthesis planning, reaction planning is still at an early stage," they say, "but the results described... hint at the potential of

this method for the discovery and optimization of useful reactions." (*C & EN* 10 February 1992).

CATALYST, ETHYLENE POLYMERIZATION JOINT PROGRAM

Bringing to market the next generation of ethylene polymers made from single-site catalysts and state-of-the-art gas phase technology is the aim of a joint development program initiated by Exxon Chemical's polymers group and Japan's Mitsui Petrochemical Co. Exxon has developed what it calls its Exxpol family of single-site catalysts, materials in which each reactive site is identical to all others. This feature eliminates variability in polymerization and allows a tailor-made structuring of the polymer, leading to product consistency. Last June, Exxon completed a plant in Baton Rouge, La., that employs the new catalysts but is based on high-pressure polymerization technology, not the new gas-phase technology. Mitsui brings to the venture expertise in single-site catalysis as well as experience with improved, more flexible gas-phase ethylene polymer process technology. The companies expect the resins resulting from the combined technologies to have improved processibility and toughness, making possible the use thinner yet tougher packaging film. (*C & EN* 27 April 1992).

NEW BOILER TECHNOLOGY BURNS COAL, WASTES

Rotary cascading bed combustion technology offers a flexible energy system that can provide an alternative to land-filling when there isn't a large enough market for recycled wastes. That's one of the conclusions Zurn Industries and others are drawing from successful demonstrations of the new boiler technology, which uses high-sulfur coal together with municipal and industrial wastes. The demonstration, at North American Rayon Corporations facility in Elizabethton, Tenn., was sponsored by Zurn, Pedco Inc., North American Rayon, and First Tennessee Development District, along with 27 other participants, contributors, and co-sponsors. Zurn says tests showed the Zurn-Pedco system could cleanly and efficiently burn a wide variety of problem coals and wastes, including industrial wastes such as coal tar and hydrolyzed solid waste, solvents, plastic film, and waste wood. For all tests, Zurn says, sulfur dioxide and nitrogen oxides, as well as particulates, were easily maintained below limits specified by the recently revised Clean Air Act. In the Pedco system, acidic gases such as sulfur dioxide and hydrogen chloride are captured and converted to harmless compounds by combining them with limestone in the combustion reactor. (*C & EN* 27 April 1992)

REACTIONS SLOWED IN LOW-DIMENSIONAL SPACES

In a simple experiment, a group of researchers has found that two reactants confined in a tight space react much more slowly than expected because the molecules tend to remain segregated. The results, along with a video simulation of the phenomenon, were presented by chemistry professor Raoul Kopelman of the University of Michigan at a recent American Physical Society meeting in Indianapolis. In a traditionl chemical reaction, reactants are mixed together by convection currents. But when reactants are placed in one-dimensional spaces like capillaries and pores, or in confined low-dimensional fractal spaces on electrodes ad catalysts, there's no room for convection currents to form and no way to stir the solution. "There's some spontaneous movement of particles through diffusion or random movement," says Kopelman, "but not enough to mix the reactants together completely so the reaction can proceed efficiently." In their experiment, Kopelman and coworkers added chemicals of different colors to opposite ends of a thin gel-filled tube. Classical theory predicts that when the substances meet in the middle of the tube they will mix and react. "What actually happened," says Kopelman, "is the two substances almost pulled away from each other at the center of the tube. Instead of speeding up, the reaction rate slowed down as the experiment progressed." It is important to understand low-dimensional effects, he adds, because many important environmental, industrial, and biological reactions take place under such conditions. (*C & EN* 30 March 1992)

PROCESS CREATES CERAMIC TO STRENGTHEN WOOD

A process that yields harder, stronger wood by modifying the cellulose fiber using ceramic material has been developed by researchers at the University of Washington. The resulting ceramic is a copy of the orginal cellulose structure, complete with openings or voids that could themselves be filled with another material to make a composite, says materials science and engineering professor Ilhan Aksay. In early work, funded by Weyerhaeuser Co., the researchers soaked wood in tetraethoxysilane (TEOS), a silicon compound used for making glass, then placed the samples in a curing oven at 500°C, where heat along with the water in the wood cells converted the TEOS into a ceramic that replaced the cellulose. Other ceramic materials have also been tried successfully. The wood-ceramic composite looks like wood, though sometimes has a different color, Aksay says. It retains the grain pattern accepts stain well, and is easy to work. (*C & EN* 30 March 1992).

SEMICONDUCTOR SURFACE COATED WITH ORGANIC FILM

The surface properties of certain materials can be altered by coating the surface with organic molecules that organize themselves into a highly

rdered thin film. Such self-assembled nonolayers have been studied successully on only a handful of substrates vhose surface is easy to clean, such as ilica glass (SiO_2) and gold. The surace of the semiconductor gallium arsenide, on the other hand, oxidizes easily, nd complex chemistry is required to et it clean, says physical chemist David . Allara of Pennylvania State Univerity. Allara's group, though, has succeeded in making an alkanethiol nonolayer stick to the bare surface of allium arsenide [*Journal of American Chemical Society*, **114,** 1514 (1992)]. Previously studied substrates could be coated simply by dipping them into an rganic solution. For gallium arsenide, he procedure is more complicated: After the surface is rigorously cleaned, solid alkanethiol such as $CH_3(CH_2)_{17}SH$ is melted on it, under itrogen, and heated at 100°C for five hours. This gives a good-quality monolayer consisting of tilted, conformationally ordered alkyl chains that are anchored to the surface via the sulfur. The monolayer inhibits oxide from growing on the gallium arsenide, Allara says, "so you've stabilized what is normally a reactive surface." The alkanethiol may also after the electronic properties of the semiconductor (as sulfide ion is known to do), possibly leading to improved device performance. Functionalizing the monolayer may open the door to chemical sensor applications, Allara notes. (*C & EN* 24 February 1992)

FOOD WASTES CONVERTED INTO DECOMPOSABLE PLASTIC

A process that converts starchy food wastes and by-products into a lactic acid-based plastic that fully decomposes into harmless chemicals when exposed to moisture or sunlight may be on the road to commercial reality. Argonne Nationl Laboratory has licensed key steps in its BioLec process to Kyowa Hakko U.S.A. Inc., the U.S. subsidiary of Japan's Kyowa Hakko, which deals in fermentation products. Kyowa Hakko plans to carry out further R&D aimed at commercialization, according to director of marketing Harry Karei. The BioLac plastic has potential applications for such products as compost bags; coatings for paper, seeds, pesticides, and fertilizers; and agricultural mulch films for time-release of pesticides and fertilizers. In the two key steps that have been licensed, one converts glucose, found in starchy food wastes, into lactic acid; the other converts lactic acid into polylactic acid. (*C & EN* 30 March 1992)

New Products

ATIRA'S ENERGY EFFICIENT "CELL TYPE AIR WASHER" BAGS HARI OM ASHRAM AWARD

Hari Om Ashram Award Prerit Ranchhodlal Chhotalal C.I.E. Research Award Endowment in Textile Science for year 1991 has gone to the **Cell Type Air Washer (CTAW)** developed at Ahmedabad Textile Industry's Research Association (ATIRA) by Scientists Sarvashri S.P. Patel, Nilim Shah and A. Chandramohan (formerly with ATIRA). The CTAW saves as much as 90% of pumping power in textile humidification. Thus it helps a typical mill to cut its power cost by 10 lakh units (kwh) of electricity per annum.

This amounts to a saving of 360 million units for the nation. Made in a modular design, CTAW has several other advantages: reduced water recirculation rate, simplicity, ease of maintenance, and most important ease of retrofitting in existing plants.

The CTAW is useful not only for textile mills but also for other industries like tobacco, paper, etc. wherever humidification systems based on evaporative cooling are needed. The manufacturing license has been given to three well-known parties; by now, the CTAW, has been installed in more than 55 plants and the demand is increasing rapidly.

This development has also won three other prestigious national awards: (1) Shri G.D. Birla Award for 'Applied Research and Development in Textiles made from Man-made Fibres', 1989-90, in the category of Energy Conservation, and (2) Century Textiles and Industries Award for 1989-90 and (3) C.D. Foundation Trust Award for 1989-90.

For details contact: Ahmedabad Textile Industry's Research Association, P.O. Polytechnic, Ahmedabad 380 015.

GAS MONITOR-KIT

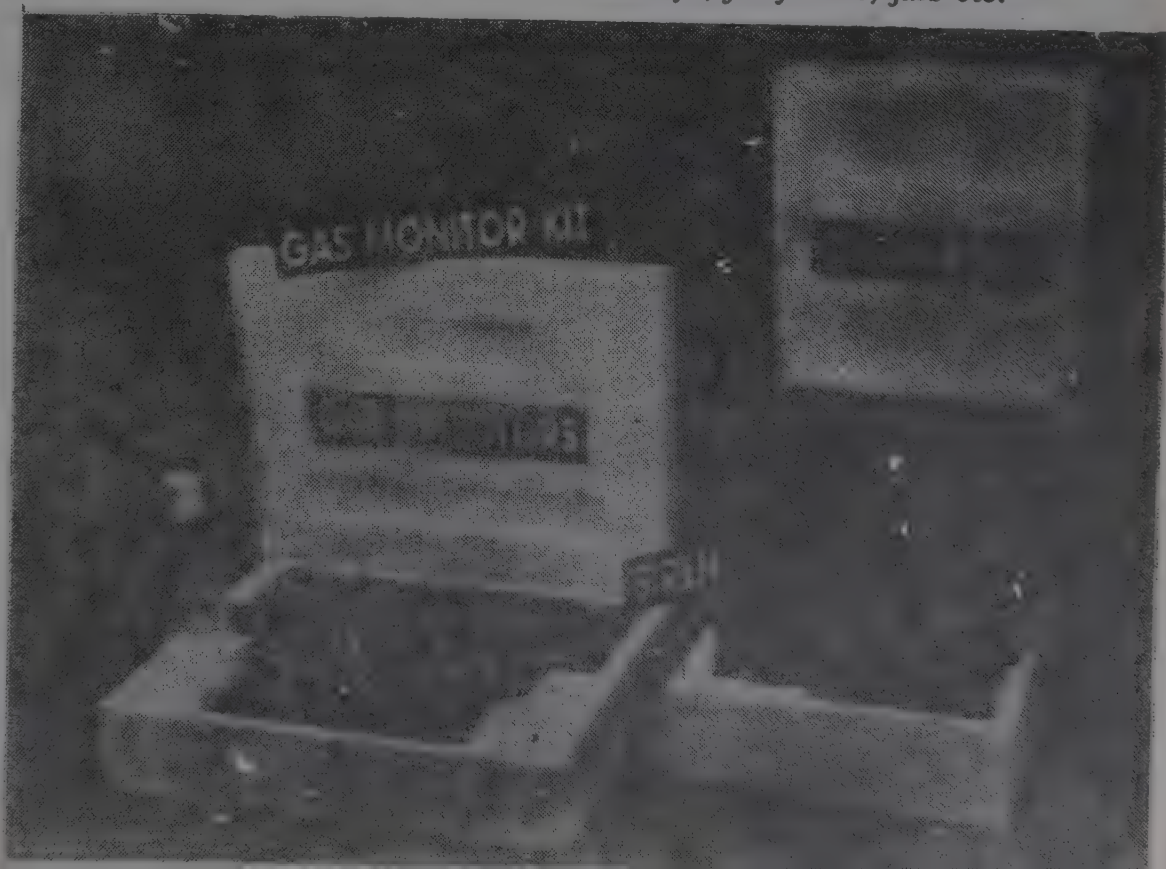
Substronics has introduced a gas monitor kit which consists of controller unit, five flameproof gas detectors and a siren. The full equipment is packed in thermocole-molded boxes for better shipment. The kit is ready to instal on site, with one feet of cable per gas detector-wise duly connected, at a maximum distance of 150 meters away from controller unit without any change in calibration. Each detector has four coloured wires.

Five locations at ambient can be monitored visually with three coloured LEDS: green, yellow red correspondingly to Low, Medium, High gas concentrations in the plant. Selection for the audio alarm at three levels such as 100, 500 and 1000 ppm or 1, 2 & 2.5% is possible just by sliding switch individually per channel. Alarm latch-in facility with optional N.O./N.C. contact for annunciator, analogue meter, recorder output are at extra cost.

The unit monitors concentrations of acetaldehyde, acetic acid, acetylene, ammonia, benzene, amines, alcohols, E.O. hexane, hydrogen methane, methyl bromide, ketones, toluene, xylenes, carbon disulphide, hydrogen sulphide, hydrogen cyanide and many other gases.

The kit is reportedly useful at solvent plants, pharmaceutical units, chemical and fertilizer plants gas/polymer plants and allied industries. The pre-calibration at L.E.L. or T.L.V. modes are provided with "Test Bottle" at the time of supply with each kit. The unit is easy to instal, operate and maintain.

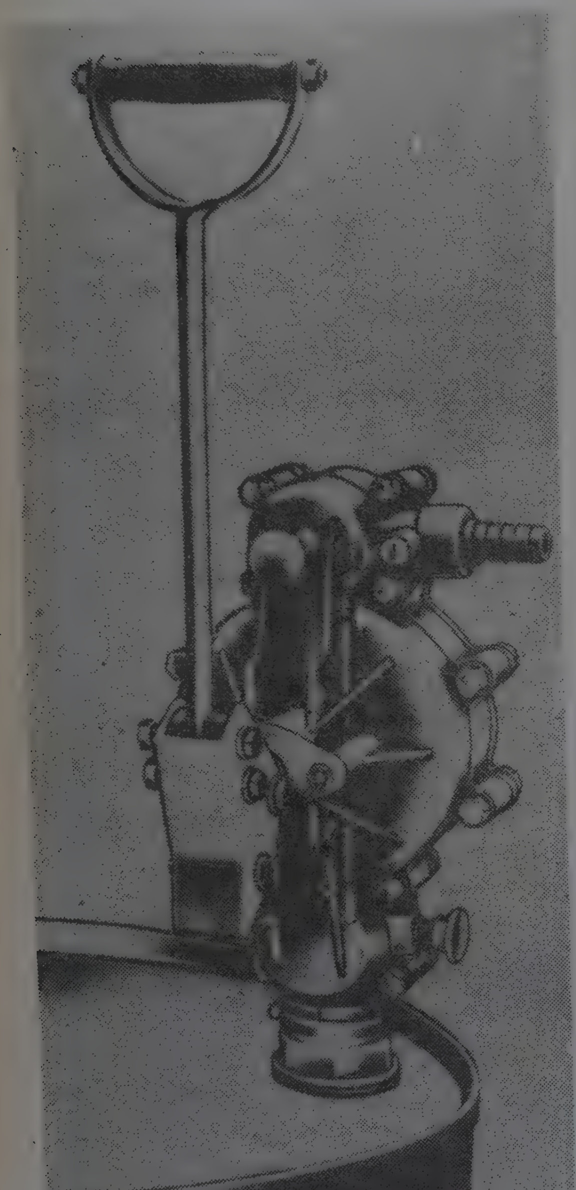
For details contact: Subtronics, Kaliandas Udyog Bhavan, Unit No. 147, Near Prabhadevi Post Office, Bombay 400 025.



HAND OPERATED BARREL PUMP FOR CHEMICALS & OILS

A hand pump, in all-plastic construction, namely polypropylene (PP) and thermoplastic polyester (PBT), has been inrtroduced for the first time in India. It is ideally suitable for transfer of chemicals and oil from barrels, carbouys, jerry cans, jars etc.

The pump in PP is used for transfer of acids like hydrochloric, sulphuric (upto 80%), nitric (upto 70%), phosphoric, acetic, chromic, spent acids etc. It is also used for inorganics like liquor ammonia, phosphorus oxy and tri chloride, all varieties of alkalis, inorganic salt solutions, hypochlorite and for vegetable and mineral oils and certain organic amines.



The pump in BPT is used for all types of aldehydes, ketones, glycols, alcohols, petroleum products and oils, acetone and aniline and their derivatives, benzene, toluene, xylene and their compounds, liquid perfumery products and pesticides, DDB, LAB, hexane, liquid paraffin and other aliphatics, cyclohexanol, cyclohexanone, styrene, vinyl acetate, ethyl and other acetates, plasticisers, chlorinated solvents, polyols, isocyanates etc.

In general these pumps are ideally suitable for transfer of liquid chemicals and oils from barrels and carbouys. They offer suction lift of 3 mts, discharge heads of 15 mts. and capacity of 30 lpm.

They are extensively used at industries like chemical, textile processing, pharmaceuticals, pesticides formulation, electronics, PCB manufacturing, sugar mills, dyestuffs manufacturing, etching plants, degreasing plants, research labs, offset presses, installation where oils, kerosene, diesel are used, and all other places where chemicals and oils are handled.

For details contact: Chemineers, 6, Jagnath Plot, Rajkot 360 001, Gujarat.

RESPIRATORS AS PER IS/9473

Venus brand respirators manufactured by Vishvesvara Enterprises are available in 3 grades and in white, grey and blue colours.

Special features of these respirators are:

* Suitable for dust, micro dust, fume, mist and smoke.
* 98.5% filtering efficiency upto 0.3 micron dust size, with high breathing comfort.
* As per IS/9473 offers complete protection.
* All filter, soft cup design, high retention capacity, low weight (max. 22 gms.).
* Adjustable nose fitting, firmly fitted elastic and sealed edges for long life.
* Can be rinsed in water and re-used.
* Covers nose/mouth, no interference in vision, does not give wearer infection.
* V-3 grade: Plain filter, Price Rs. 255/- per packing of 15's.
  V-30 Grade: Filter + Exhalation valve, price Rs. 312/- per pack of 15's.
  V-90 Grade: Filter + Exhalation valve + net reinforcement, price Rs. 384/-per pack of 12's.
* Use against coal, ash, metal fumes, foundries, welding, fumes, dye crushing, caustic fumes, silica, fibreglass, tobacco, oil vapours, tyre, asbestos, mines/collieries, fertilizers/agro, sand blasting, chromium, alumina dust, coffee, bulk drugs, sulphur, enzymes, wire industry etc.

For further details contact: Vishvesvara Enterprises, B-1, Akash Apts., Makmali Talao, Agra Road, Thane 400 601, Maharashtra.

KRISHI TANTRA'S NEW PRODUCT

Krishi Tantra Sanstha, Pune, a pioneer organisation in bio-fertiliser has come out with another product 'Saphal'.

This is liquid soil conditioner available in 120 ml bottles. The liquid contains millions of miraculous microorganisms capable of fixing aerial nitrogen and solubilising in soluble phosphates in the soil. The micro-organisms also possess unique property to secrete antifungal agents preventing pathogenic fungi to grow in the soil. Thus the microbial activity in the soil is enriched by agriculturally useful microorganisms while harmful fungi are prevented to grow.

With two bottles of 'Saphal' used on an acre of land it has been shown that 40 to 50 kg. of atmospheric nitrogen is made bioavailable to the crop. This is equivalent to two bags of urea having 23 kgs. of nitrogen each. As compared to chemical nitrogen the cost of two bottles works out to be Rs. 128 while for the same amount of nitrogen supplementation by chemical fertiliser one has to pay Rs. 320.

'Saphal' has other advantages over chemical fertilisers because unlike chemical fertiliser it helps to develop and retain organic, microbial and ecological balance in the soil.

GLASS TUBE TYPE ROTAMETER

Fitzer manufactures precision on-line direct reading, flow rate measuring glass tube rotameters for almost all types of liquids and gases. These rotameters are designed to meet the needs of chemical and allied industries, pilot plants and laboratories where the rate of flow of liquid or gas inside a pipeline or tubing is to be measured with a degree of accuracy. The rotameters are available in the required range with high and low flow alarms. The low flow rotameters are available with micro in-built flow control valves and D.P. regulators. The minimum range for air is 200 cc/min and for water 10 cc/min. The maximum range is 5,000 LPM for air and 200 LPM for water. The by-pass rotameter arrangement is available for high flow measurement for, line size above 50 mm, 300 mm NB and flow rates upto 800 M^3/hr for water. All rotameters are individually calibrated for accuray better than +/- 2% of full range.

For further details contact: Fitzer Instruments Co. (India), 248, Agtali, Near Ambivli Station (W), P.O. Mohone, Dist. Thane 421 102.

CONTROL EQUIPMENT FROM M.B. CONTROLS

Digital Temperature Indicator

M.B. Control offers Model DT-206 Digital Temperature Indicator, having 6-way manual temperature selector switch using latest integrated technology for reliable and accurate temperature measurement.

The unit accepts as inputs all types of temperature sensors. The instrnments accuracy is within $\pm$ 0.5% to $\pm$ 1% $\pm$ LS digit. DT-206 with point to point linearisation providing error within $\pm$ 1°C over the full range are also available.

Automatic cold junction compensation and line resistance compensation is provided in these instruments. The unit has built in sensor break indication and protection. Power supply 220/110V AC.

All DT-206 instruments undergoes dynamic burn-in test to weed out any components failure. These instruments are housed in size 96 x 96 x160 mm. DIN standard strong metal enclosure.

DT-206 is ideally suited for ovens, furnaces, tea industries, plywood, paper, cement, steel, fertilizers, beverages, food processing plants etc.

Flow Indicator/Totalizer

The FT-901 Digital Indicator/Totalizer, has 3 digit LED digital display of volumetric flow rate (in lit/hrs, kl/hrs, m^3/hr. etc). The flow totalization is done via a six digit manually resettable electro-mechanical counter. Ft-901 has in-built square root extractor and power supply for the transmittar.

FT-901 can receive inputs (current/-voltage) from various flow meter i.e. DP transmitter, Ultrosonic, Vortex, Magnetic etc.

Power supply required is 220V AC/110V AC. The flow totalizer is housed in size 96 x 192 x 220 mm, DIN standard strong metal enclosure.. FT-901 are ideally suitable for all flow measurement.

Digital Programmable Timer

The Model TM-101 Digital Programmable Timer has a range of 0.1 Sec. to 999.9 Min. Four digit LED display shows the remaining time on the front panel. These required time is generating by using accurate quartz crystal oscilla tor. The required two is set via thumbwheel switches on front panel. The control signals to the timer i.e. 'Start' and 'Reset' are optically isolated.

Power supply required is 220V/110V AC. These timers are housed in size 96 x 96 x 160 mm. DIN standard strong metal enclosure.

TM—101 are ideally suited for timing controls in plastic, rubber, chemical process, material handling etc.

For further details on the above three products please contact: M/s. M.B. Control & Systems Pvt. Ltd., 31/1, Ahiripukur Road, Culcutta-700 019.

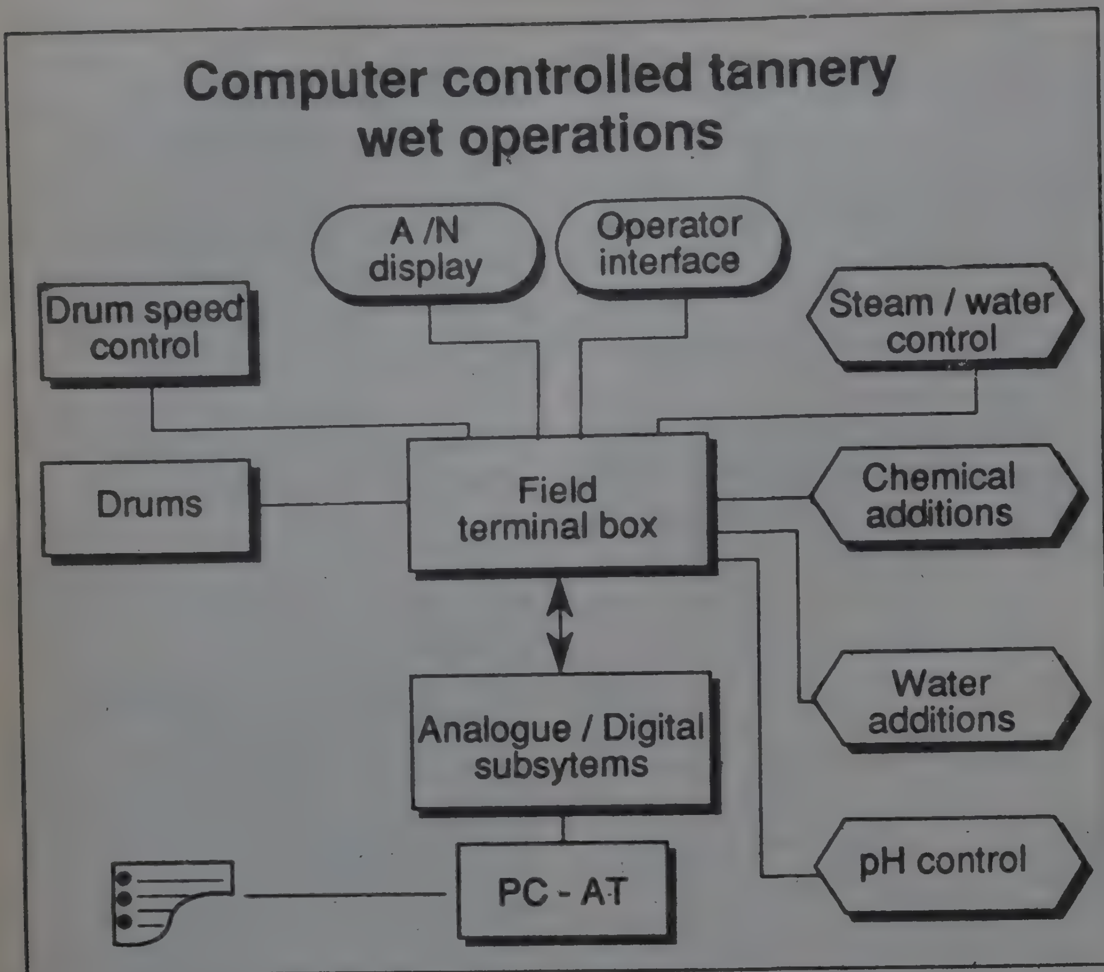
AUTOMATED TANNERY PROCESS CONTROL

Of all the process sections in an Indian tannery, wet process section is least organised and sub-optimally operated from scientific angle. The working conditions are not conducive for improving the productivity of a tannery worker and enhancing his technical skills. Qualified technical personnel are therefore not attracted.

From material and energy utilisation point of view, large quantities of chemicals and water are either wasted or utilised, effluent streams carry more pollutants load than is necessary and significant process time is consumed by often repetitive operations contributing to human drudgery.

Processes like washing, deliming, pickling, chrome tanning, stripping, basification, neutralisation, retanning dyeing and fat liquoring need to be modernised to achieve good leather quality. Under the aegis of an Integrated Mission Programme of the seventh Five year plan for the Modernisation of Indian leather industry CLRI had undertaken investigations to develop know-how and design engineering package.

The wet section of the tannery with 24 drums, in a leading tannery in Tamil Nadu, has already been modernised with temperature controlled hot/cold water storage system, chemical tank form, microprocessor controlled water and chemical addition system, partially automated drum section and central room with a mimic panel. The drum section was equipped with a sepecially designed working plarform with a



mezzanine floor for solid and liquid feeding operations. Process water and chemical lines, electrical cables, liquid drain lines and wet solid discharge facilities were located in the ground section of the working platform.

CLRI conducted a technoeconomic study to assess the overall benefits of this experiment. It is interesting to note that the achievement of consistent leather quality with marginal upgradation is tthe important economic factor for promoting the modernisation concept effectively. The social relevance of modernisation of tannery wet operations under Indian context lies in achieving better working atmosphere and culture for the tannery personnel. Drudgery was reduced in several repetitive operations and work procedures were streamlined. On environmental front, significant reduction in toxic chemical loads in waste streams was achieveable through better control on material and chemical inputs.

A policy decision was taken by CLRI in 1990-91 to develop simple process control packages for partial automation of small scale Indian tanneries.

Pilot scale demonstration facility

CLRI in association with the Central Electronics Engineering Research Institute (CEERI), Pilani (India), established a pilot scale demonstration facility in March 1991 consisting of a twin drum system equipped with computer assisted chemical and water additions, pH control and drum rotation control. Figure shows the salient features of the pilot facility. The facility is being made available to tanners to test the new control systems for all the wet operations mentioned earlier and found real time benefits of implementing the computer assisted process control systems in small scale tanneries. Environment friendly options like enzymatic unhairing and CO deliming will be integrated into the new control package as add-on technological options.
(H. Purushotham and K.V. Raghavan, Chemical Engineering Division, CLRI, Madras — Courtesy: *The Hindu*).

INNOVATIVE PLASTIC MAILING COVERS/ENVELOPES

Supreme Marketix has pioneered by introducing for the first time in India their Innovative Plastic Mailing Covers/Envelopes with varietty of different materials & wide range of colours, thicknesses and sizes. They have Economical (Compatible with Conventional Paper Covers) as well as Impressive Fancy Range (Pearl Finish & Perfumed). The Window Covers can be fabricated, successful franking can be done with Special Inks, closing of covers can be done by heat sealing or special adhesives and writing with Ball-pen and Typing is very much possible. Moreover, these covers are lighter in wt. which saves Postage & Courier Charges and are tough, nontearable, water/moisture/termite proof, longer lasting, reusable and has good scrap value too!!. It protects your documents in transit against rough handling and reaches safety in the hands of receiver even in MONSOON!! There are already 50-60 customers who are successfully & satisfactorily using these covers, the Names includes; Philips Kodak,Bank of America, Can Bank Mutual Fund, Bank of India Mutual Fund, Klockner Windsor, Santogen Silk Mills, Eagle Films, VIP Films & so on.

For details contact: Supreme Marketix, 128, Shivshakti Indl., Estate, Andheri-Kurla Road, Andheri (E), Bombay 400 059.

BIS STANDARDS FOR ASBESTOS CEMENT BUILDING BOARDS

Asbestos cement building boards find wide application in building industry because of their lightness and flexibility combined with adequate strength. They are mainly used as interior fittings where no load or very little load comes on them, for example, partitions, false ceilings, almirah panelling, dado works, laboratory table tops, etc.

The Bureau of Indian Standards has brought out IS 2098: 1964 'Specification for asbestos cement building boards, wherein the requirements regarding composition, dimensions and tests have been laid down. The stand-

ard prescribes that the manufacture of the board shall be from clean asbestos fibre, cemented together by ordinary rapid hardening low heat Portland cement or blast furnace slag cement with no organic or inorganic materials added. The standard specifies that the boards shall be free of defects that impar appearnace or serivceability and shall have uniform texture. Further, as the boards are not meant for use under heavy loads, the breaking loads have been fixed at 15 kg. for class A and 10 kg. for class B boards. Also the water absorption has been fixed at 40 per cent of the dry weight of the board.

The boards have now been covered under the BIS Certification Marks Scheme and users may feel confident getting quality and worth of their money in return because of the stringent quality control checks by BIS.

NEW HEAT TRANSFER MEDIUM FOR SAFE AND ECONOMICAL OPERATION

Diphyl THT is a new synthetic heat transfer fluid from Bayer AG (THT stands in German for partially-hydrogenated terphenyl). It is highly suitable for the transfer of large amounts of heat in non-pressurized systems at temperatures between 0 and 345°C. The high thermostability due to the tried and tested polyphenylene structure guarantees an above-average service life even at high temperatures. Non-pressurized operation in the liquid phase increases operating safety and saves on costs.

Diphyl THT is an ideal substitute for other organic heat transfer media which, because of their low boiling points, must operate under pressure at temperatures above 300°C. Building elements, pipelines, working parts and seals for example, which are most strongly stressed in pressurized systems, are more economical and requires less maintenance when Diphyl THT is the heat transfer fluid. The use of Diphyl THT obviates the need for additional heating, usual in the case of diphenyl and diphenyl oxide systems, to maintain the pumpability of the heat transfer fluid.

Plant builders and operators are therefore increasingly turning to non-pressurized heat transfer systems. With its high boiling point, Bayer's new heat transfer fluid is the high-performance medium necessary for this application. The fluid is designed for use in processing plants in the chemical and petrochemical industries. Diphyl THT is also suitable for waste heat recovery and therefore helps to save energy.

For further details contact: Bayer (India) Limited, Express Towers, Nariman Point, Post Box No. 11509, Bombay 400 021.

SELF-CLOSING KNIFE HINGES IN 'DELRIN' ARE GUARANTEED FOR AS LONG AS YOU OWN YOUR HOME

If there were *Guinness Book of Records* listing for product endurance, Amerock Corporation's "Marathon" self-closing knife hinges would probably take the honours in home cabinet hardware. After 250,000 open/close test cycles — ten times the industry's 25,000 cycle standard — hinge locking arms showed little signs of wear, requiring the same 0.4 newton-meters (56 inch-ouches) of torque to operate as they had initially.

The standard is based on the average performance of steel knife hinges —they open and close like a clasp knife. The ability of Amerock's patented hinge to outperform it by such a wide margin is due to a unique design in "Delrin" acetal resin. In most such knife hinges, coil or torsion springs provide the locking force. The "Marathon" hinge's latching arm is a spring — an integrally molded, cantilevered spring that doubles back on itself.

"We tested prototype arms in steel," says David Cress, senior project engineer and inventor of the hinge. "But fatigue failure occurred far short of our performance goals". Had a steel spring met design requirements, a plastic boot or roller at its tip would have overcome friction problems, according to Cress. And the fitting probably would have been in "Delrin". That line of thinking resulted in a further exploration of the material's performance capabilities.

"We had used the spring-like attributes and good surface properties of 'Delrin' in other hardware," he explains. "A switch to 'Delrin' in a multifunction hinge design not only would allow us to reduce both the number of components and assembly steps, it also would give the hinge a contemporary look."

Most self-closing knife hinges have eight or more parts — two steel wings that pivot against each other with the aid of a rivet and two friction-reducing plastic washers; a spring held in place with a rivet; and a boot or roller. In the final design, there are three components: the door wing of "Delrin" with its integral spring latching arm; a steel frame wing; and the rivet that joins them.

There are other advantages. Not only does "Delrin" provide needed mechanical strength and stiffness, its low wear/-low friction characteristics offer quiet, smooth operation during the hinge's long service life. Sleek design complements such cabinet styles as the semi-concealed look, and Pyramid Plastics in Rockford uses proprietary color blends of "Delrin" to mold it for Amerock in four popular shades — bright brass, burnished brass, nickel and white. And the fact that the resin resists corrosion and attack by paints, lacquers and most solvents widens its adaptability to many situations and uses.

"Finite elements analysis and extensive testing helped to minimize relaxation and load stress," Cress points out. "That accounts for the design's unsurpassed performance. In fact, Amerock has such confidence in the hinge that it backs it with a waranty for as long as a buyer owns his home."

GLOBALISATION OF INDIAN CHEMICAL INDUSTRY:

Opportunities & Challenges for Polymers and Speciality Chemicals

Z.F. LASHKARI
Vice President, Polyolefin Industries Ltd., Bombay

INTRODUCTION

Much has been said in the recent past about the opening to global competition of Indian Industry by Politicians, Economists, Industrialists and others.

What is pertinent for us in Chemical Industry is to review:-

a) Whether the current changes have had an impact on the Chemical Industry.

b) Effect of globalisation on our domestic market and potential export markets.

c) The effect of competition in areas of Chemical Industry which were sheltered by barriers of licensing of industry, or imports and by tariffs.

d) What are the competitive advantages available to Indian Chemical Industry in the field of polymers and speciality chemicals.

e) Areas of vulnerability and measures to overcome or offset areas of vulnerability.

An attempt is made in this Paper to review the above by some examples from each Industry by taking one product as guideline.

GENERAL PRINCIPLES

While we in India have taken steps towards globalisation, by removal of various barriers, this has to be seen in the context of the worldwide environment. The effect of 92-93 budget has not been adverse, for most segments as may be noted from Annexure II.

Globalisation

Globalisation involves integration of flows of trade, investments, technology and communication which are tying economies together. Technology is the single most important factor driving the evolution of global competition.

By opening markets to competition, better quality, price, etc., would become available for local customers also. (We have all experienced effects of competition in Auto industry).

In the field of trade, the situation worldwide appears to be far from ideal if one keeps in mind the emergence of three giant regional trading blocks viz. North American Common Market under US leadership, EEC and Asia Pacific under Japanese leadership protectionism on a multicountry scale.

While India accounts for 15% of world population, 1 1/2% of world production and only half per cent of world trade significant globalisation has taken place among financial markets. Approx. 500 billion dollars cross the worlds frontiers daily. This makes it increasingly difficult for any country to avoid substantial external impacts on its economy. Massive capital flows (when rupee is made fully convertible) are inevitable and are likely to depreciate the rupee further.

Against this backdrop of trade and finance, when one considers the current status of technology of some of the segments of chemical industry, the competition (when joined) is initially most likely to be of David-Goliath type rather than among equals. The competitive pressure on polymer and speciality chemical manufacturers in India will be significant and Indian companies will need to orient competitive strategies to survive and flourish.

Competitive Strategies

The survival and growth of an Industry including chemical is a result of an ongoing dynamic interaction of various forces/pressures viz:

-- Pressures from outside (like trade protocols, inter-Governmental deals).
-- Competition from within
-- Threats from outside (like dumping)

Ability to withstand pressures depends on our bargaining power, both as a buyer and as a supplier. Michael Porter, (the doyen on current thinking on competitive business strategies) states that advantages will accrue to organisations if the customer is provided with a superior

-- Price and/or
-- Value

This in turn leads to two generic strategies based on:

-- Cost leadership, and/or
-- Product or service differentiation.

Paper Presented at the IIChE seminar on "Globalisation of Indian Chemical Industry — Opportunities and Challenges" in Bombay on May 9, 1992.

Technology & Innovation

A society's capacity for sustained technological innovation is crucial to economic well being of the nation. This is easily realised when one compares Indian Industry vis-a-vis Japanese.

In a global economy where finance and people are mobile and when barriers to trade are falling, technology and innovation is also becoming global. In a competitive world, characterised by non-stop innovation, simply buying or creating new technologies, and funding research in Universities is not enough. These steps which were de rigueur a couple of decades ago, are too far removed from the rapid pace of commercial innovation required to be competitive in global markets.

According to Kodama, successful companies are not necessarily those that create new technologies but those that can rapidly absorb them and apply innovation rapidly, no matter where this originates from. This requires an organisation culture rather than specific features of the technology itself, which determines how quickly the new technology is diffused in a company.

Japanese who are trail blazers in technology absorption, and innovation are directing R&D budgets towards co-operative research particularly in areas where hitech breakthroughs appear promising.

POLYMER & SPECIALITY CHEMICAL INDUSTRIES

The backdrop of globalisation, competitive strategies and influence of technology/innovation has a relevance for Indian polymer industry & speciality chemicals industry.

Polymer Industry

The Polymer Industry is a heterogeneous one which (for the purpose of this Review) is segmented into:

-- Commodities like polyolefins, PET, nylons, ABS, fibres like nylon polyester, acrylics etc. Each of the commodities has numerous grades to provide a variety of applications in different markets. These account for 95% of world trade but are low value products with price less than $ 2/kg.

-- Engineering Plastics like polyacetal, polycarbonate, PTFE, PVDF, etc. These, as names suggest are primarily for engineering applications and replace metals by virtue of performance or cost. These are sold at values ranging from $2-5 per kg.

Dupont has forecast that by year 2010, 50% of current usage of die cast metals, hot rolled steel and structural steel will be replaced by engineering plastics, accounting for approximately 9.0 million tonnes.

-- Specialities like poly ether ether ketones, superabsorbing polymers, liquid crystal polymers, conducting polymers, etc. Products in this group are the costliest and provide specific performance advantages.

Speciality Chemicals

This listing covers a very large group of products which are characterised by their own business peculiarities. Annexure-I (reproduced from Dr. Mashelkar's talk at ICMA's 1989 Amin Memorial Lecture of ICMA) lists them and also characterises them based on ease of technology and ease of entry in current markets.

POLYMER INDUSTRY

Commodities

a) World Markets and Capacities

Polyethylenes form the largest group in polymer commodities and is used as a typical for this group.

India's ethylene capacity of 0.22 Mio. MTpa is likely (based on current proposals) to rise as under to:-

92-93	0.520 - MGCC
96-97	1.220 - IPCL Gandhar/Reliance Cracker/NOCIL
97-98	1.755 - UB Cracker
98-99	1.950 - Haldia
99-2000.	2.555

This is assuming all current proposals fructify. If the above is seen in relation with ethylene capacities worldwide of 32 Mio. MTpa even by year 2000, our capacity of 2.5 Mio. will barely be 7-8% of present world capacity or around 2-3% as further capacities get installed in other countries.

Since ethylene capacities are predominantly for polyethylenes, our polyethylene capacity will be similarly small compared to world standards. We are hence already a Liliput among giants. Capacities likely to come on stream will barely meet the pent up local demand in most of the commodities.

b) Trends in Technology

Some major trends are:-

i) Most commodities are based on relatively simple chemistry perfected many years ago. Developments in tech-

nology are directed towards chemical engineering improvements like larger reactors, and larger plant sizes, better and more universal catalyst systems. At present no less than 20 technologies are available for the production of HDPE alone.

ii) Developments worldwide in technology are currently towards "universal" reactor/catalyst systems which allow a wide range of product densities in polyethylenes. Several have already been commercialised. MGCC's BP swing process and Reliance's Sclair process are under implementation. Efforts are now directed (Carbide has commercialised) at the same reactor being used for copolymerising other monomers, leading finally to products with properties ranging from polymeric to elastomeric. Quantum Chemicals has commercialised a reactor system capable of producing grades of Thermoplastic olefins with EP rubber content 2-3 times of ones produced so far.

iii) Other technological developments are directed towards niche market strategies; e.g. HDPE based bonding material for bonding EVOH to PE in blown films; EVA based adhesive for bonding BOPP to EVOH opens up newer markets.

iv) Recycling of plastics and other materials is fast gaining momentum, more so in EEC due to newer environmental laws which give "cradle to grave" responsibility to industry. Technologies for recycling of mixed materials are under development.

v) There is an increasing trend towards co-operative research involving two or more laboratories focused on a specific development. Annexure III indicates some examples of Japanese co-operative efforts.

c) SWOT of Indian Polymer Commodity Industry.

i) **Strengths**

India's strength is a large domestic market. Unlike Taiwan, Japan and a host of other manufacturers. we have our own feedstocks like naphtha, NGL and natural gas which can become a strength if Government policies are framed and executed more pragmatically than hitherto.

ii) **Weaknesses**

a) Though the industry has been in existence for over two decades, there is an absence of worth-while R&D. Technology assimilation, development and upgradation has been dismally below achievements of other countries. Not surprisingly, a major weakness of this segment is a total dependence on technology from overseas (which fortunately is, by and large freely available).

b) High capital investments are needed for economic sized plants; plants of 50 KT are obsolete. Current sizes are around 200 KT.

While polyethylenes have been used as illustrative, the status of other commodity polymers produced and marketed in India is more or less the same.

iii) If the strength and weakness is measured against the background of basic concepts dealt with earlier, it appears unlikely that in the remaining 8 years of this century, India is likely to be a significant player in this market unless we can attract substantial foreign investment.

d) Opportunities would be however available for:

-- Products from polymers which need a significantt labour content like tarpaulins, etc.

-- Certain grades which are no longer feasible to produce on newer reactor-catalyst combinations and would provide India with niches in the commodity markets.

-- Neighboring markets like Africa, Sri Lanka, Burma, etc., provide a significant freight advantage.

-- Bilateral trade agreements provide a competitive advantage.

e) Challenges

In these circumstances the primary challenge for entrepreneurs and policy planners would be (to learn from mistakes of the past 2-3 decades) specifically:

-- Ensure a stable and balanced feedstock policy.

-- Entrepreneurs must shed their mutual distrust and get into co-operative research as no single company or laboratory would be capable of developing inter-disciplinary skills or have resources to catch up with the neglect of decades. In fairness a small start has been made in the field of catalysis by Indian scientists.

-- Since commodities are based on refinery or cracker products as feedstocks, the location policy for such cracker/ polymer plants should be revised. Isolated crackers would lose out on advantages accruing from pipelines allowing networking of feedstocks for the crackers and more so for feedstocks for downstream polymer plants, like ethylene, propylene feedstocks, etc.

-- Import of secondary feedstocks like ethylene has been started in a small way. This should progress to full scale

trading. Primary feedstock like gas (being flared away) should be made available at low cost for value addition to ethylene, etc. which can be exported.

Engineering Plastics

The engineering plastics form the middle range of polymers for specialised engineering application. Except PTFE, none of the other engineering plastics (ABS, nylons are commodities) are currently manufactured in India though plans to produce both polyacetal and polycarbonate resins have been announced.

For this paper polytetrafluoroethylene (PTFE), is reviewed as typical of this class.

a) Worldwide Markets & Capacities

Worldwide consumption of fluoropolymers totalled 66,000 tonnes in 1991, and expected to increase to 81,000 by 1996 reflecting average annual growth of 4.2%. According to a recent study, consumption of fluoropolymer resins is estimated at 48,500 in 1991 and is forecast to rise to 59,000 tonnes by 1996, an annual growth rate of 3.9%. The US market comprises 47% of the worldwide total market.

PTFE is the dominant fluoropolymer resin comprising almost half the total worldwide volume and one-third of total value. In this context, Indian PTFE capacity of 500 tonnes represents less than 1% of the 1991 demand.

A major drawback to fluoropolymers is their cost — the least expensive (PTFE and PVDF) are in the range of \$13-14 per kg. compared to \$ 1.0/kg. for HDPE. Consequently the number of producers is fairly small.

b) Trends in Technology

i) Technology licensing and joint venture activities is expected among fluoropolymer suppliers particularly Japanese throughout the 1990s.

ii) Availability of worthwhile technology locally for engineering polymers like Polyacetal, Polycarbonates, PPO, PPS is non-existent.

Technology is not easy purchasable as most of these are held by global cartels who do not have any motivation to give up their dominant positions sometimes even to their local subsidiaries.

iii) More extensive use of blends with elastomers and commodity polymers to gain advantages on properties keeping the cost under control.

For e.g. in Europe six main families of blends currently account for a capacity of 275,000 tonnes. These are:

PP/EPDM	90,000
PC/ABS	49,000
PS/PPE	43,000
PC/PBT	31,000
Modified nylon	18,000
PVC/ABS	16,000

iv) A case study of Dow as the largest plastic producii company in the world reinforces this point. In a spa of 6-8 years, Dow has become the third largest produc of polycarbonates. It is now moving aggressively in tl field of blends of plastics and inspite of a current depressed market, Dow is investing in manufacture ar blending capacities worldwide.

c) Weaknesses

For a survival under globalisation, Indian entrepreneurs wi have no option except to catch up with the rest of the worl by inviting (if feasible) investments in collaborative venture with basic engineering plastic manufacturers. IPCL - GE ver ture is a step in the right direction.

d) Opportunities should be availed of utilising our scientifi manpower for the development/production of blends tailor made for specific applications. (This fits in with the strateg of gaining competitive advantage via service). Companie would need to set up good market development laboratories A critical scale of operations is essential to enable invest ment in technical development and survival during tougl times likely in initial stages.

Polymer Specialities

a) Markets & Capacities

Relatively newer high value polymers also called performance plastics (e.g. PEEK, LCPs, conducting polymers) are sold at high values. The capacities installed are small and provide for high growth opportunities due to R&D and innovative applications. As these are knowledge based products manufacture does not always involve capital intensity. However this area has currently attracted a lot of attention and a shake out with some large producers going out of some of the businesses is imminent.

b) Technology

i) R&D efforts in India has been so far restricted to lab scale.

ii) This is one area where we in India can create opportunities by strategically focusing on our research strengths towards only 1-2 products and following through to commercial success. Development of such strengths locally would enable us to be in a better position to negotiate

strategic alliances with manufacturers and technology holders for R&D and manufacture and thus a step in this market.

Polymer Industry — Opportunities & Challenges

Summarizing,

India's decision to join the global bandwagon has come not a day too soon (I hope) for Indian Polymer Industry to lift itself out of the current oblivion, when compared to most major countries around the world.

That, this industry is vital for India's core needs for food, shelter, clothing, conservation of forests and alternatives to metals, glass at lower energy usage is incontrovertible. We need to catch up on decades of governmental dithering and entrepreneurial timidity with a short and a long term approach.

In the short term, due to a lack in intrinistic technological strengths, the industry will need to attract and facilitate multinational investments and thereby obtain both technology and finance (as was done in the 1960s).

In 60s and till mid-80s, a large population (by implication, a market) was our strength. In the last 4-5 years, the rest of the world has globalised. Moreover India's track record in recent years of converting policy pronouncements to action by bureaucracy has eroded national credibility. India has no alternatives and more so now, since globalisation would make available India's market without a need to invest.

Hence opportunities in the short term would perforce be restricted to utilization of our only strength viz. scientific manpower and concentrate all efforts on:

-- developing alloys and blends of plastics
-- polymer recycling technologies
-- speciality polymers.

by utilising multidisciplinary co-operative research teams working to achieve market need identified products.

Major challenge before us is:

-- To build up our own technological base in each of the three industry segments which along with our market potential will give us strength to negotiate on equal footing with investors and technology sellers.

-- Another major challenge would be to develop a culture of co-operative team work to achieve results rather than show off individual brilliance. Our scientists are very capable. We may have persons (not necessarily from Research) who can provide leadership and direction to these teams. This (by training) would probably be available from managers with experience in Industry.

-- Create a culture of interdisciplinary approach with expectation of time bound result achievement by suitable incentives and rewards for the team. Most of the awards in the field of science are for individuals. It is worthwhile to have an equal number of awards for teams of research scientists.

-- Encourage development of speciality polymers and their applications at laboratory and on a commercial scale. This would help cash in on our intrinsic strengths, without massive funding needed in case of commodities and engineering plastics.

-- Ensure that opening of markets to competition does not result in decimation of local strengths (substandard though they may be). Votaries of market economy like USA, Europe, Japan still ignore or circumvent GATT and other agreements if their industry is threatened.

-- Build up bilateral ties with firms in other countries particularly from within the region, as co-operative working would make available bigger markets to both the parties with resultant benefits.

-- Speed the removal of structural, ideological and political barriers which have led to feedstock deprivation for industry — e.g. gas which is flared, delayed decisions on crackers. The use of industrial alcohol as renewable resource (for ethylene) should be freed from current political shackles.

-- Build up expertise in international marketing and trading which will help us to identify niche areas where our intellectual strengths rather than fiscal muscle will yield results. To quote a Chinese proverb "In shallow waters — shrimps will make fools of dragons."

SPECIALITY CHEMICALS

The outlook by contrast to the Polymer Industry is definitely upbeat for several reasons.

A wide range of products and markets comprise this sector as can be noted from Annexure I. This in turn provides a variety of choices and opportunities.

To prioritize our opportunities, the field is reclassified on the basis of markets and resources.

Markets for Specialities

Domestic Markets

These can be broadly subdivided into

a) Those needed for recovery of natural resources like mining chemicals, oil field chemicals.

b) Additives for product performance enhancement like additives for cosmetics, food, fuel, lube, paint, paper, poly-

mers, rubber chemicals, construction chemicals, flavors and fragrance.

c) Functional needs like industrial cleaning, metal finishing, industrial enzymes, electronic chemicals etc.

d) Technology based specialities like drug and diagnostics from biotechnology.

i) The chemicals in category (a) above are utilized and purchased by Government agencies and though large volumes are involved, the business is not known to be available on normal commercial terms. Consequently many capable entrepreneurs stay away from this market. The situation is not likely to change in a hurry.

ii) Chemicals for functional needs (c) demand a comparatively low level of technology and we have a strong base of this industry for our domestic market.

Chemicals in category (b) & (d) offer the best short term opportunity and several Indian entrepreneurs are active in this field. Globalisation would lead to sophistication of needs and here the strategy suggests good chances of success are available to technocrat entrepreneurs who provide a good value or service.

Differentiation would arise from entrepreneurs providing a superior service and tailor-making specific products and where pertinent, full systems (in collaboration with equipment suppliers) to be competitive in these markets.

While India has a proven competence in chemistry, sophistication would come from better understanding of surface phenomenon and research in physics and chemistry of surfaces and as a good deal of effort is needed towards a finished product whose value is both aesthetic and based on performance.

Additives and drug intermediates and products being commercialised based on biotechnology appear promising and are hence dealt with in this paper, as there is a commonality in opportunities and challenges.

Export Markets

In August 1990, the Export Import Bank of India brought out a Paper on "What India can Export to Industrialized Markets". The study goes on to recommend an export basket taking into factors such as products, India's supply capacity, market attractiveness, etc.

In the case of chemical industries, it was observed that penetration into OECD markets by India was in the medium/low matrix. The study identfied thrust products based on a potential evaluation matrix as shown in page 135.

Resources

Natural Resources

India is one of 2-3 nations in the world with climatic zones ranging from equatorial to alpine and ecological diversity not found in any single country in the world. This should provide a large base for industries like food additives, drugs, diagnostics, flavors and perfumes, natural colorants, etc.

An ICMA Study published in 1989 titled "Organic Chemicals from Natural Resources" was followed up by a seminar. This study lists opportunities and problems.

Quite a number of natural materials are exported in a raw form and later reimported as finished products at high values. These should provide a challenge to our technologists to avail ourselves of the benefit of value addition.

Human Resources:

Our pool of scientific manpower has been talked about perhaps once too often. If is about time our entrepreneurs took calculated risks on utilising them correctly and effectively.

Those entrepreneurs who have done so like Dr. Gharda, Dr. Reddy, have reaped worthwhile benefits.

We have quite a few scientific institutions which have achieved excellence like Center for Cellular and Molecular Biology, Indian Institute of Chemical Technology, NCL and others.

Trends in Some Markets

The field is too vast to review trends worldwide against the backdrop of which one can identify opportunities and outline challenges. So an attempt is made to touch upon a few areas.

Drugs & Pharmaceuticals (Other than traditional)

a) The pharmaceutical industry is undergoing a transformation due to mergers and acquisitions as it is realised that a "critical mass" is needed to fund R&D and then expeditiously exploit opportunities globally. It is estimated that by 2000 AD, 25 drug companies which currently account for 50% of world market will consolidate to 15.

b) Biotechnology's contribution to pharmaceuticals development is flourishing and its influence will contine to grow. By the end of the decade, all new pharmaceuticals will have been touched in one way or another by the disciplines associated with molecular biology.

The red blood cell proliferating protein, erythropoietin (EPO), (which has been gaining market approval since 1989) has a very high probability of being ranked in the top 50 drugs by 1995.

Monoclonal antibody-based (Mab) therapies are now emerging. The products likely to make an impact will be the 'third-generation' antibodies and have a promising future. Mab-based therapies for the treatment of septic shock is forecast to become a $300m-plus business.

c) More drugs going off patent list over next few years will have competitive pressures on princing.

d) New developments including the increased use of chiral drugs (which have greater specificity of action and used in smaller quantities) will have a major impact leading to growing demand for highly specialised contract development and production services.

e) Demand for high value chemical intermediates from European pharmaceutical manufacturers is expected to rise from $ 565 Mio (1991) to $ 678 Mio. in 1996.

In the Western European intermediates markets, the largest segment is the aromatics, (major products chiral phenyl glycine) and various amino and nitro compounds. Sulphur intermediates in the aliphatics sector are likely to be used widely in the production of anti ulcer drugs. Key heterocyclic intermediates are a variety of 5 and 6 member ring structures including furan and imidazole molecules. Major alicyclics identified are cyclohexyl, cyclopropyl, cyclobutyl and piperazine derivatives.

Highest growth rates are anticipated for fluorinated intermediates followed by chirals and nucleic acid derivatives.

In terms of value expected categorywise (by 1996), for West Europe:

- Aromatics $ 368
- Aliphatics $ 157
- Heterocyclics $ 109
- Alicyclics $ 44

Flavours & Fragrances

Indian aroma and fragrance industry produces 300 aroma chemicals out of 1500 used by industry. The Indian industry comprises 6-8 medium scale units and 50-60 small scale units. India exports large quantities of high quality essential oils and floral extracts. The exports of mentha oils and derivatives is now a Rs. 100 crore business with India being the 2nd largest producer in the world. This industry can expand further. However, local costs of basic materials countinue to be high inhibiting this growth. Prices of citronella and lemon grass are currently double of those prevailing in the world due to various reasons, predominantly low yields and pressures on land. Local customs also add to the problem. Thus jasmine (due to reasons of strong local flower market demand) has a higher cost compared to Egypt etc., where this is grown for the oil content. While considerable progress has been made especially in the last few years, there is scope for value added products in this group, both natural and synthetic. Thus, jasmine extract sells for Rs. 10,000 per kg. while purified jasmine oil sells at Rs. 30,000 per kg. in the French market.

Natural Products

a) Cosmetic Additives:

World cosmetic industry is dominated by 20 large companies. However, the trend currently is to use more natural products in skin care formulation. To illustrate, a chain of "Body Shops" which opened in 1976, in UK, to sell only biodegradable non-animal tested products has spread to 40 countries, exploiting the increasing environmental awareness among consumers.

POTENTIAL EVALUATION MATRIX

		Low	Medium	High
Market Attractiveness	High	--	--	Other Pharmaceutical Products
	Medium	Paints	1. Industrial Plastics 2. Starch & derivatives of natural products	1. Bulk Drugs 2. Pesticides 3. Essential oils 4. Flavours & Perfumes 5. Dyes & its intermediates
	Low	--	1. Cosmetics 2. Detergents 3. Tanning & Colouring Materials	Finished formulations

India's Capability & Environment

b) Oleo Resins and Spice Oils:

While in the last few years some progress has been made by this Industry and a couple of companies are active in this field, India as the largest producer of spices, has still a long way to go to make value added products from good quality spices.

Opportunities exist in upgrading the quality of stock and yields. Thus in case of cardamom where India accounts for 70% of market trade versus 20% by Gautemala, India's exports are now less than 2000 tonnes compared to Gautemala's 10,000 tonnes. Special spices produced in India can also provide niche markets where India could excel provided the yields are improved and prices are kept at reasonable levels.

Opportunities

-- Exports to targeted developed countries to build up reputation and brand name as well as confidence in competitiveness and service. This marketing base which will take 3-4 years to establish could be used as a spring board for other less sophisticated markets where difficulties in bre throughs in developed markets would provide nee expertise in international marketing. All such efforts costly and require a critical mass as well as finan strengths (in the initial stages) not available with sm medium scale manufacturers. Trading houses and gro providing a variety of products/services could co-ope for mutual benefit.

-- Utilise biotechnology for better yields from natural fe stocks and chemistry/chemical technology for value ad natural products which due to environmental concerns, likely to have a sustained export demand in 90s.

-- Utilise a large pool of microbiologists and biochemist set up small business in diagnostics and drugs based molecular biology.

Challenges

To exploit opportunities summarised earlier, we wo need to overcome the following challenges:

Annexure - I

MAJOR PERFORMANCE CHEMICALS

Category	Apparent Profitability	East of Entry Technical	Commerc
Adhesives and sealants	High	Hard	Hard
Construction chemicals	High	Medium	Hard
Cosmetic additives	Average	Medium	Hard
Diagnostic aids	High	Medium	Medium
Elastomers	High	Hard	Hard
Electronic chemicals	High	Hard	Hard
Enzymes (Industrial)	Average	Medium	Hard
Flavours & Fragrances	High	Medium	Hard
Food additives	Average	Medium	Hard
Fuel additives	High	Medium	Medium
Dyes (functional)	High	Medium	Medium
Foundry chemicals	Low	Medium	Medium
Industrial cleaning products	High	Easy	Medium
Lube additives	High	Medium	Hard
Metal plating and finishing chemicals	High	Medium	Medium
Mining chemicals	Average	Medium	Medium
Oil field chemicals	High	Medium	Medium
Paint additives	Average	Easy	Medium
Paper additives	Average	Medium	Medium
Photographic chemicals	High	Hard	Hard
Polymer additives	Average	Easy	Medium
Rubber Chemicals	Average	Medium	Hard
Surfactants	Average	Easy	Easy
Textile auxiliaries	Average	Easy	Easy
Water management chemicals	High	Easy	Hard

Annexure - III

EFFECT OF CHANGES IN CUSTOMS & EXCISE DUTIES

	CIF Price	Pre-Budget					Post Budget					Effect of change in custom, excise duties and forex rate		Local Price as on 1.4.92	Price of Import	
		CIF Price	Custom duty				CIF Price	Custom duty								
	$/MT	$=Rs.26 Rs/MT	Basic + Aux. ad valorem %	Spec Rs/MT	CVD %	Total Rs/MT	$=Rs.31 Rs/MT	Basic + Aux. ad valorem %	Spec Rs/MT	CVD %	Total Rs/MT	Rs/MT	% of CIF price	Rs/MT	Pre-Budget Rs/MT	Post Budget Rs/MT
A. Basic Feedstock																
Benzene	346	8996	40		546/ MT	4144	10726	25		546/ MT	3228	-917	-10.2	14544	13140	13954
Ethylene	504	13104	25		Nil	3276	15624	25		Nil	3906	630	4.8	12848	16380	19530
Propylene (Chem. Gr)	386	10036	120		16.50	15686	11966	80		17:25	13288	-2398	-23.9	14376	25722	25254
Methanol	144	3744	130		16.50	6288	4464	110		17.25	6527	239	6.4	7907	10032	10991
Acetone	471	12246	120		16.50	19140	14601	110		17.25	21350	2210	18.0	19975	31386	35951
B. Polymers																
PP	784	20384	50	5000	33.00	26932	24304	50	5000	46.00	36222	9290	45.6	31880	47316	60526
HDPE (Blow Moulding)	993	25818	50	3000	33.00	29679	30783	50	3000	46.00	41012	11333	43.9	31295	55497	71795
POM	2750	71500	50		22.00	59345	85250	50		23.00	72036	12691	17.8	N.A.	130845	157286
SBR (Grade 1500)	1176	30576	120		16.50	47790	36456	110		17.25	53308	5517	18.0	62568 (Pre-bud.)	78366	89764
C. Specialities																
Polymer antioxidants	11500	299000	120		16.50	467337	356500	110		17.25	521292	53955	18.0	N.A.	766337	877792
Cyclohexyl mercaptan	3170	82420	120		16.50	128822	98270	110		17.25	143695	14873	18.0	N.A.	211242	241965
Triethyl aluminium	8420	218920	120		16.50	342172	261020	110		17.25	381676	39505	18.0	N.A.	561092	642696

-- strategic breakthrough in sophisticated export markets would need co-operative alliances, and experience in international markets.

-- we have a major challenge to persuade our politicians and bureaucrats to accelerate implementation of structural changes which have thwarted efforts of several entrepreneurs. Many such impediments have been identified in th ICMA study on "Chemicals from Natural Sources".

-- Develop multidisciplinary teams of biotechnologists, chem ists and chemical technologists to make chemicals an additives from natural sources economically competitiv with those from other countries.

Annexure III

SOME EXAMPLES OF CO-OPERATIVE RESEARCH IN JAPAN

1. Research Association of Oxygen — Enrihcing Membrane-aided Incineration Technology (established in Septembe 1982)

Themes and nature of collaborative research 1982-86.	:	High polymer membranes -- oxygen-enriching membrane -aided incineration technology-common fundamental oil alternative energy development system
Members	:	Toyabo, Asahi Glass, Teijin, Toray, Nippon France, Nihon Cement, Osaka Glass.

2. Research Association of Polymer Basic Technology (Established in August 1981)

Themes and nature of collaborative research 1981-90	:	High Polymers — development of materials with elaborate functions — high performance polymeric separating membranes, conductive polymeric materials and highly crystalline polymeric material — fundamental industrial R & D promotion system for the coming age.
Members	:	Toray, Teijin, Asahi Glass, Asahi Chemicals, Toyabo, Kuraray, Sumitomo Electric Industry, Daicel Chemicals, Mitsubishi Petrochemical, Sumitomo Chemical, Mitsubishi Chemical, National Chemical Laboratory for Industry, Industrial Product Research Institute for Polymers and Textiles, Electrochemical Laboratory.

3. Research and Development Institute of Metals and Composites for Future Industries (established in 1981)

Themes and nature of collaborative research 1981-88	:	Development of composites (FRP, FRM) — important technology.
Members	:	IHI, Kawasaki Heavy Industries, Teijin, Toshiba Machine, Toray, Toyota Motor, Nippon Carbon, Fuji Heavy Industries, Mitsubishi Chemicals, Mitsubishi Heavy Industries and Mitsubishi Electric Industrial Products Research Institute, Mechanical Engineering Laboratory, Research Institute of Polymers and Textiles, Government Industrial Research Institute, Osaka & National Research Institute for Metals.

4. Research Association of Production Technology for High Performance Resins (established in August 1983)

Themes and nature of collaborative research 1983-87	:	R&D for new production technology for high-performance resin.
Members	:	Mitsui Petrochemicals, Mitsubishi Chemical, Mitsui Toatsu, Toray and Seikisui Chemicals.

All Roads Leading to Rio de Janeiro

Dr. O.P. KHARBANDA
501, Olympus, Bombay-400 026.

This is not at ravelogue, an impression by the above title, though Rio could convey an image of romance and adventure. The reference here is to the UNCED (United Nations Conference on Environment and Development) Earth Summit Conference in June 1992, claimed to be the:

World's last chance to avoid ecological catastrophe.

Likely to be world's biggest environmental conference ever. The '92 Globol Forum, in Brazil is to be held amidst increasing danger of failing to live up to its lavish billing. Some of the reasons for this are stated to be: poor organisation and the likely South - North confrontation. (Christina Lamb: 'Summit in danger of crashing to earth' Financial Times, Nov. 7, 1991 p.21). This article lists and analyses the problems facing the organisers of the 'high profile' environment summit. The Feb. 1992 Special Edition 30 page brochure describes this event on the cover as:

A series of simultaneous events that provides an opportunity for all sectors to express their indepedent views.

It is expected that over 5000 non-governmental, mainly environmental, organisations will take part. Naturally, Brazil is lobbying for the participation of the heads of the rich industrialised countries. Early confirmations were received only from Mr. John Major and Mr. Mikhail Gorbachev, but since then the latter is out of office. If, as expected, only a few heads of the over 150 countries attend and no meaningful agreement is reached, ecologists fear that the conference may actually set the environmental 'clock' back! An Amazonian specialist, Mr. Philip Fernside, counters:

We can't go any farther back than we are!

Clearly the present sorry state of affairs in this regard is largely the making of the North (industrial world), but South (developing world) is being asked to equally share the burden and the cost of cleaning up. Patently unfair, though nothing new. North's argument is that earth is a common heritage, hence 'saving' it must be the combined responsibility of everyone — of course, while polluting our planet, they thought it was entirely their business! Some double standards!! And these are likely to be exposed to the world with enormous impact specially if the conference is televised live. Dante B Fascell (Democrat, Fl) Chairman of House Foreign Affairs Committee is forthright:

The developing countries are pointing their fingers at the industrialised ones, saying 'you guys fouled up the world and now you are trying to correct it at our expense'.

Coming from the 'horses mouth', the statement is quite refreshing It has been estimated that with less than 5% of worlds population, USA emits over 25% carbon dioxide. On basis of a charge of $15 per ton of carbon emitted over and above their legitimate share, the developed world owe the world community about $90 billion per year for cleaning our common environment.

Following are some of the key questions facing the Earth Summit:

* Climate change, the so-called 'greenhouse effect', is a major issue, but the US refuses to accept is as a global issue, much less agree to a time table for reducing carbon dioxide emission. Perhaps the worst sufferers in this regard is South; Brazil and Malaysia with large forests, and the main culprit: North — the industrialised world.
* For a sustained and meaningful attack on the problem, Brazil, India and Mexico insist on transfer of technology, at present largely with the rich developed countries.
* A planned treaty on forests seems to have collapsed for lack of agreement on the rational use of the world's remaining forests.

The press, worldwide seems to be playing down the Summit even dubbing it as a mere 'photo opportunity'. The International Chamber of Commerce and Industry, with over 7000 members including General Motors and DuPont, is trying to pre-empt the event by having its own conference in the preceding month to evolve a prescription for balancing environment protection with economic development.

It seems patently clear that Brazil's President Fernando Collor de Mello will use the platform to attack the developed world for its 'empty rhtoric', since the promised $1.5 billion environmental project to be financed by the G7 group of leading industrialised nations is yet to take off. Then there are serious problems of logistics and finance. Over 20,000 people are expected to attend the conference against only 12,000 suitable hotel rooms available. According to the norm for all UN conferences held outside their headquarters (New York and Geneva) the host nations must bear all extra costs, including the travel and hotel expenses of UN officials. But thanks to Brazil's deeply troubled economy, the conference budget has already been slashed to less than half, i.e.,

$33 million. And perhaps 60% of this is earmarked for security which, in any case, remains the biggest headache for the organisers. Further, though Brazil is home to the world's greatest biodiversity and largest rainforest, it also has perhaps the biggest income gap and Rio is bursting with slums sprawling across hillsides amidst polluted bays and collapsed infrastructure. No wonder the preparatory meetings for the summit have been losing mementum. Mr. Jonathan Porritt, former head of 'Friends of the Earth' one of the pressure groups observes:

The process is in serious trouble. There are so many outstanding issues to be resolved and many nations have taken entrenched positions.

One can hope for the best, even hoping against hopes! But the indications as of now really give little ground for hope.

On the eve of his visit to Tokyo and New York for discussions regarding the summit, Hon'ble Kamal Nath, Minister of State for Environment & Forests, Government of India, already seems to have written its epitaph:

It would die a natural death. It's all linked up with the funding.

But the concern about the problem is serious enough for the Hon'ble Minister to have announced mandatory environmental audit from 1993, and the relevent rules with format of the audit have already been published. And even new phrases have been coined in this regard, the **green accounting**, a movement which is gaining momentum. Many countries are likely to follow the lead of Norway, perhaps the first country to introduce an environmental audit.

Integrated Waste Processing: Transformation into Products*

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ABSTRACT

Omega Thermal Technologies, Inc. "Omnivore™" takes a completely integrated approach to waste treatment. The "Omnivore™" includes advanced modular incineration and vitrification technology. The "Omnivore™" fulfills the OTT motto "Waste In - No Waste Out™" with unsegregated waste. The "Omnivore™ completely contains hazardous wastes. With simpler wastes, redundant components of the "Omnivore™" are not needed.

Omega's approach is complementary to the environmentalist's efforts to reduced and source separate waste. Removal of the simpler and higher value waste makes the residual waste harder to treat and it has a higher concentration of heavy metals. The VITRAloc® module will receive the most attention. The value of vitrification is recognized. With the VITRAloc® vitrification module products can be made from hazardous wastes, such as asbestos-containing and heavy metal contaminated wastes. Containment and ease of handling are primary engineering criteria. The design enables no additional feedstock separation, and no opening of the transportation containers before waste is safely within the processor.

NIMBY sentiments and increasingly stiff regulatory pressure has raised the minimum stands of waste processors. Omega believes that money spent on extra engineering design, so the equipment exceeds minimum regulatory requirement, than on permitting and political pressure is wise. Omega's design blends in with other buildings in an industrial park. The products from an "Omnivore™" include energy (electricity, steam, or oil), glass and metal, while performing to yield an exceptionally low risk analysis.

Integrated Waste Processing: Transformation into Products

The increased awareness of environmental pollution in the world has created a demand for new approaches to waste management. The environmental movement is strong in America, Australia, and Europe. Also, the people of less developed countries are less willing to risk their health by having polluting industries. Since pollution represents unconverted product, frequently technologically advanced companies are finding that whole product design producing less waste improves their international competitiveness. Omega's "Omnivore™," which converts waste into products, is a superior thermal treatment alternative. This technology recovers energy, metals for recycling and converts the residual inorganics into useful glass products.

Omega has a contract to design and construct an "Omnivore™" complex in the USSR. Omega anticipates another contract to design and construct another waste to product complex in another region of the USSR. USSR experts and academicians have found Omega's "Omnivore™" technology superior to leading European companies.

Omega is the only company that has been granted a petition by the U.S. EPA to process asbestos-containing waste material (ACWM) into products. In July 1991, according to a reliable regulatory source, the U.S. EPA will issue to Omega the only NESHAP permit to convert ACWM into metal ingots and VITRAform® glass. The ACWM processor is a derivation of our "Omnivore™" technology.

One of Omega's newest processing systems near Melbourne (Laverton) Australia was fully commissioned in May 1991. A steel drum containing waste can be introduced unopened into the processor. This unit has the only automatic bulk charger of its kind in the world. Containers as large as 40 foot sea containers full of medical waste are processed without human handling. The unique features of this processor will be reviewed before describing the additional benefits of

* Text of the paper presented at "HAZPAC '91" Cairns, Australia in April 1991.

the modular VITRAlloc processor component of Omega's "Omnivore™" technology.

The "Omnivore™" achieves zero waste output because of a holistic or integrated design. Many processes add other ingredients that result in a larger volume of material that has to be disposed of or marketed. In contrast our vitrification example shows significant reduction in leaching potential without significant addition of additive. In a commercial regional vitrification facility, the waste from one industry can be the additive for another waste to produce the required quality of product. An affiliate company of Omega is establishing a > 400 ton/day regional vitrification facility near Philadelphia, PA, USA.

Trends & Omega's Solutions

The following references to United States legislation are examples of what Omega believes is a trend in the world. Siting a waste facility even in a depressed area desiring jobs, requires other factors to make it politically attractive. There are many organizations that oppose facilities that they believe are environmentally unsound.

No Landfills Needed

The "Omnivore™" technology is politically attractive and is complementary to the goals of groups such as Greenpeace, Inc., which have opposed incinerators. The "Omnivore™" converts all wastes, even the more difficult wastes left over after waste reduction and waste segregation, into products. With this technology and the potential option of composting organics, the need for landfills can be eliminated.

Exceptionally Low Environmental Risk

Many states, such as Louisiana, have quantified emissions limits by statute. While Louisiana was previously considered environmentally lax, the new regulations will require each point source of emission to cause less than 1 excess cancer death per million people[1]. The screening analysis of an Omega facility has shown several orders of magnitude lower cancer risk than even this tough new regulation. Louisiana, like many other states, is significantly increasing the fee for disposal of both intra and out of state wastes[1].

Simultaneously, citizens are becoming more aware that they have to solve the waste problem, as illustrated by the bumper sticker "We all live downstream." For waste disposal alternatives that do not really solve the problem, the public and politicians, reminded by satellite pictures of spaceship earth, are increasingly extending the distance of the definition of "NIMBY" or "not in my backyard".

No Stack Necessary

Political and public opposition groups know that hi stacks reduce the ground level concentration of pollutan but do not reduce the actual amount of pollution. Omega h refined its thermal processing facility to where the dischar from the air pollution control (APC) train can be a vent the roof. This greatly enhances the important visual attra tiveness of the facility.

No Wastes Produced

Now the public and regulators carefully evaluate the re duals or wastes that come from all industries and the pote tial for air pollution. Most industrial plants generate wast Omega's "Omnovore™" produces no liquid or solid wa output. Figure 1 shows that all processing streams, inclu ing APC gatherings, are recycled into the processor and co verted into useful products.

Exceptionally Low Air Emissions

The independent computer aided control of combustion the points in the processor and the extensive APC train ensu that incoming waste is not converted into airborne pollutan While some groups oppose carbon dioxide emissions, co version of any volatile organics to carbon dioxide is esse tial. Proper combustion conditions significantly reduce nitro oxide production. The APC train removes formed sulf oxides.

Recycling Advantage

Regulations frequently require an integrated approach a evaluate the project in relation to the whole setting[2]. T force management of waste, the EPA is requesting was management plans from each state. Individual states have s up requirements for comprehensive waste management(3,4 Preferential awarding of bids to those with the highest amou of recycled material, or allowing a premium if the produ contains a minimum amount of recycled material, a several states' way of encouraging recycling[5]. The "Omni ore™" can takes advantages of recycling laws both for t siting of the processor and in the sale of the product.

Alternative Energy

Burning fossil fuels produces the energy we demand. Wh the carbon dioxide model used by many environmental grou may be seriously flawed[6], the efficient combustion of wa to produce energy instead of using other refined fossil fu does not add to the net production of carbon dioxide.

Pyrolyzer Alternative

Efficient incinerators convert the carbon in the waste

carbon dioxide and energy. The Middle East Crisis increased the interest of replacing the Omega oxidative thermal processor in the "Omnivore™," with an Omega pyrolyzer. Omega intends to prove the pyrolyzer commercially on a simple feed stream such as tires, before adaptation to a more complex feed stream. This would allow for the additional production of oil[7] from the "Omnivore™".

Process Requirements

As recycling of waste such as paper, aluminum cans, and glass increases the remaining waste will become more concentrated in toxic and hazardous components. Non-sorted waste is only going to become more difficult to treat and contain. Eventually, unless the heavy metals are chemically bound or recovered, the inorganic residue or waste will be hazardous.

The "Omnivore™" is the final processor of waste, that means it is robust and insensitive to variations in waste composition. Omega generally as part of the process design concentrates the waste even more. This process has resulted in opportunities to recover separate feed streams. For Omega, concentrated wastes at centralized processing facilities offers new opportunities for product recovery.

Liability Elimination

Once a waste is dubbed hazardous, the generator retains ownership and any associated liability forever[8]. The various federal, and state act requires tracking and manifesting of special and hazardous waste. Placing the special or hazardous waste material in a landfill does not remove the long term liability of the waste. Transforming the waste into a product eliminates the liability.

Containment

Omega design criteria are to introduce the waste unopened into the processor, and to maintain containment of the waste. The Omega thermal processor recently commissioned in Australia has a proprietary automatic feeder. A patent-in process specialized docking and live floor feeding mechanism, allow contained and controlled feeding of large containers such as roll offs or sea containers.

Many incinerators, have two stage feeding isolation. Omega uses a three-stage isolation system, which feed unopened steel drums directly into the thermal processor. This highly unusual combination of charging possibilities is allowed by Omega's Vibratory Hearth.

Versatile, Robust & Rugged

Due to the nature of the patent-pending Vibratory Hearth, we can charge anything onto the hearth that will fit through the charging aperture. The water-cooled hearth eliminates the problems of slagging. The Vibratory Hearth is fired from the top, and temperatures, sufficient to melt steel drums can be obtained. The material travels uphill to traverse the hearth, so thermal treatment time cannot be bypassed due to shape. Liquids are completely volatilized because a liquid containment dam is part of the hearth. The residence time on the hearth is adjustable to allow for variations in waste content.

The Vibratory Hearth stirs the wastes by continual agitation, with no moving parts exposed to the waste. Air is introduced under the waste, leaving the inorganics free of carbon. The material that falls off the hearth into the VITRAloc® module or the ash bin in "vitrified" like a slagging rotary kiln. The ash from a Vibratory Hearth that has been in operation for over three year in a medical waste incineration application, contains detempered steel needles in heterogenous glass globules. The glass globules get sticky and agglomerate the finer ash that would be present in normal incinerators.

Clean Air

Omega processors achieve exceptionally low emission levels by minimizing production of pollutants, and by using a highly effective air pollution control train. These basic Omega design principles have been proven commercially for over a decade[9]. When processing wastes Omega installs reductant devices that provide emotional security for the regulator and political, even if technically they are unnecessary.

For example HEPA, (High Efficiency Particulate Air), filters are associated with removing airborne asbestos fibers. In the Omega processor, any airborne asbestos would be transformed into glass due to the high temperatures and long secondary chamber residence time; way before the particle even enters the APC train. In addition, from a performance basis, an already included standard baghouse traps these submicron particulates very effectively[10]. Even if not absolutely needed, an asbestos-containing waste processing "Omnivore™" will have a HEPA filter module after the baghouse.

No Wastes

Normal wastes contain significant quantities of metals. Without a vitrification module, any thermal waste processor will produce a residue, which is concentrated in leachable heavy metals. Contrary to this, the Omega VITRAloc® vitrification system produces glass and metal as separate-product streams. This reduces the metal oxide content of the glass.

Vitrification

The thermal industry is mature, and equipment is designed to process a narrowly defined feedstream with the lowest possible cost. While many existing thermal equipment can meet the temperature requirement of vitrification, none can handle

the variety of material present in real world waste without presorting or processing. Some incinerators can handle a wide range of materials, but they are not designed to operate at the temperatures necessary to transform inorganics such as asbestos into harmless compounds. The traditional rotary kiln, does not provide the degree of control needed to prepare inorganics for vitrification. The Omega VITRAloc vitrification module in the "Omnivore™" solves these problems.

Glassmaking Basics

Silica is the most commonly used glass former. Silica by itself makes a superior glass (fused quartz) but its fusion temperature is so high that traditional manufacturing techniques are not suitable. Silica is the least expensive additive for traditional glass products. Glass is a commodity product and the amount of more expensive additive is minimized.

Modifiers give glass the desired melting, forming and product properties. Fluxes are added to silica to lower the melting point. Various intermediates also are used to achieve desired properties in the glass melt and the final glass product.

The common fluxes are sodium and potassium oxides. Too high a concentration of these fluxes reduces chemical durability. Modifiers such as calcium oxide (limestone) or magnesium oxide (dolomite) improve chemical durability.

Traditional glass making involves determining the desired compostion of the glass bath and then blending the required pure chemicals. Omega has developed proprietary and patent pending processes to start with wastes or off-specification products, to make a quality dark glass.

Product Requirements: Homogeneity

Homogeneity of a product significantly increases its value. A homogeneous product need only be tested once to verify that it meets certain criteria. Proper process control assures that the composition and appearance of the product can be consistently reproduced.

Compositional Tolerance

The compositional limit for a construction grade aggregate is very large, in comparison to the compositional requirements for clear glass products formed on a high speed line that have to have final dimensional tolerances of a few thousandths of an inch. With a larger processor, closer chemical control of the product is more economic. The closer chemical control allows for production of higher value products.

Reduction in Leaching

In the United States and other countries if there is potential to leach and contaminate ground water supply, a waste is hazardous. Table 1 shows the potential for vitrification transform a waste. The specific waste and the details of chem istry are confidential. Omega and another company are deve oping a process that will be added to that company manufacturing process. Not only can they avoid hazardou waste disposal costs, but they can recycle some product bac into their process. In addition they will have a sellable gla product.

The results are from the more stringent TCLP test of th Environmental Protection Agency than the prior EP toxici test. The table explored a broad experimental range of fin glass composition. A TCLP ppm value of less than 5 mean the material is non-hazardous. The process will easily con trol the final glass composition within the range of the be results. The only leaching element of concern was lead. Le than 30% of other ingredients were added to the tested wast These other additives also could be wastes. The tested wast was from a thermal process.

Table 1

LEACHATE POTENTIAL REDUCTION

Target Temp.	Additive Composition	TCLP Lead PPM
Start	NA	17.2
No	1	6.3
Yes	1	0.50
Yes	2	0.37
Yes	3	0.42
Yes	4	0.059
Yes	5	0.25
Yes	6	0.22

The results show that the potential to leach lead, with minimum additives, can be readily decreased from 1/30 to 1/300 of the starting material. Temperature is a very important factor. A commercial facility would have better mass transfer. Over a hundred fold reduction in leaching potential could be consistently obtained. The best results were not obtained by increasing the additives.

The resulting product had structural integrity and would have been tested as a monolith in the EP toxicity test, versus having to be ground up for the TCLP test. The monolith would have over 1000 fold less surface area. The leachate result would be proportionately reduced.

Product Marketability: Recycling Incentive

To encourage recycling, state legislatures are passing legislature that would encourage state purchasers such as the Department of Highways or Transportation to use recycled

material. This is done by awarding bids based on the highest percentage of recycled materials and allowing premiums to be charged for recycled materials[11].

Aggregate

Glass incorporated into asphalt[12] gives a more durable surface since glass is more acid resistant than most road construction aggregates. Glass cullet has not received enthusiastic support as an aggregate, as it contains labels and other contaminants. Since glass cullet is primarily soda-lime glass, the high sodium content limits applications in cement products. The glass from the Omega vitrification process can be compositionally controlled to be compatible with cement requirements.

Omega's glass aggregate will be dark due to the transition metal oxide content in the waste. The glass material will look like obsidian. There may be many landscaping applications of this product. The glass also can be foamed to produce low density glass.

Shaped Products

In addition the glass can be molded into practical shapes ranging from tile to curbstones. For larger Omega vitrification facilities the final product will be higher value shaped commodities. Shaped products such as slate, and tiles will require little customer eduction. The high price of natural slate and the ability to make a better glass slate substitute provide a floor to the market value. The elastic nature of demand allows this premium product to compete against the larger formed cement tile market.

Competitive Alternatives

Vitrification of waste has been feasible for a long time. One company in operation today comes to the site and vitrifies the entire site without excavation. The process has a high cost but leaves a monolith in place. (The major problem is that the heat distills and concentrates potential toxic components into the soil around and below the vitrified area.[13]) The common thermal devices are cited in patents to process waste.

Glass Furnace Designs: Overview

A traditional glass furnace is the heart of U.S. Patent 4,632,690 and gives high temperatures to treat hazardous waste[14]. In the glass manufacturing process, the feed stock is homogeneous in composition and must be within a narrow particle size. The raw materials need to be heated to the melting point, this can be done by top firing, submerged firing, or by electrical heating.

Submerged Firing

A submerged fire configuration allows a much higher efficiency of heat transfer than a top fired furnace. Besides having a high heat transfer to the liquid media, the exit temperature of the gas is close to the temperature of the melt. Submerged firing is particularly effective in mixing minor components with the glass. However, the increase in bubble formation made the refining process or removing residual bubbles more difficult.

Electric Heating

Electric heating, which heats the glass though the Joule effect and adds no bubbles, is preferred. In most modern glass furnaces there are provisions for top fired heating and submerged electrode heating or boost.

The difficulties of using electric furnaces involve the treatment of metallic components that are present in the waste. There are two approaches. One is removal of the metal stream before introduction into the glass furnace. The second is oxidation of the metal within the farnace. One company's patented approach is to oxidize metals such as alumimum on an apron within the furnace before being introduced into the glass melt[15].

Oxygen may be introduced into the glass to oxidize any metals. Molten metal is denser than the glass, and it is physically difficult to achieve efficient mass transfer from a rising oxygen bubble to a falling metal glob. In addition the small partial pressure of oxygen that is imparted to the glass phase substantially increases the rate of corrosion of the expensive submerged electrodes used to heat the glass.

In practical application, any unoxidized metals sink to the bottom of the furnace and "donwward drills" through the critical refractories. If sufficient unoxidized metal accumulates, a short circuit appears in the electric furnace; shutting the furnace down and requiring extensive reconstruction.

Processing of Asbestos-Containing Waste

Vitrifix of North America has a process patent for the detoxification of asbestos, which uses a significant amount of glass cullet and requires the addition of sodium hydroxide as a flux, which lowers the melting point of the asbestos[16] but also increases the leaching potential of the resulting glass. The process uses a standard electric glass furnace that inadequately treats organics or metals.

Induction Heating

Induction heating is an effective commercial process and used extensively in the purification of metals. Traditionally homogeneous feed materials are used and are heated uni-

formly by the electric field. This method of heating has a lower heating effectiveness than heating by Joule effect. Electrical induction devices are cited in patents for the destruction of refuse.[17, 18]

Omega's VITRAloc® Vitrification Module

Omega's vitrification module in the "Omnivore™" uses submerged combustion to homogenize the heterogenous waste. Proprietary and patent in process methods allow for unlimited feeding of metal components, and continuous withdrawal as needed. In larger facilities, the glass composition is more closely controlled and conditioned so more valueable glass products can be produced.

Conclusion

Omega is aggressively placing its advanced technology into commercial practice. Omega has a commercially operating system in Laverton, Australia, which has not yet been fitted with the VITRAloc® module to make it an "Omnivore™. Soon Omega will be commercially producing VITRAform[1] glass from waste. The combination of these two commercial applications will produce an commercial "Omnivore™" facility.

Omega's "Omnivore™" technology contains the waste, so containers can be introduced unopened or unloaded without human handling as in Laveraton. The thermal processor due to the vibratory hearth and vortex burner is insensitive to the wastes physical shape and chemistry. The "Omnivore™" takes "Waste In - No waste Out™" The vitrified products have a wide area of application, in commodity and specialty markets.

By generating revenue on both the treatment and product side with the "Omnivore™", the cost of treating waste via vitrification is significantly reduced. The overall cost of processing waste can be less than landfilling. With a composting operation to increase some environmental groups support, together with the "Omnivore™", Omega eliminates the need for landfills. Omega firmly believes that working with environmental trends is not only good ecology, but also good business.

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Pesticide Rinsewater Treatment Processes: A Review*

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Introduction

This review is concerned principally with small plant-scale treatment processes for pesticide rinsewaters. Rinsewaters result from the wash-down and rinse-out of facilities used for the production and use of pesticides. There is growing pressure on the limited toxic liquid waste disposal facilities available to receive such wastes. It is increasingly necessary both to modify management practices to limit the production of these wastes, and to examine measures that can be used for treatment on the plant site.

This review covers the following processes that have been used or promoted for the treatment/destruction/disposal of pesticide residue organic compounds:

* Landfill
* Fixation/solidification
* Carbon adsorption
* Biodegradation
* UV plus oxidation (with ozone or hydrogen peroxide)
* Incineration
* Chemical oxidation
* Wet oxidation

Landfill, Fixation/Solidification

Landfill is the traditional method for waste disposal and, with pretreatment such as solidification, continues to be used as a method for disposal. However, there is considerable public concern over the siting of such landfills and some Australian states require disposal only to central controlled facilities. Such concern could be expected to spread to onsite disposal which also results in contamination of the site which can impact future land use. Landfill does not appear to be a long term in-site disposal notion for plant or small scale operation; it may be appropriate for dealing with spills in field use. (SPCC, 1989).

Fixation/solidification aims to immobilize the waste by its incorporation as minute droplets within a solid matrix of pozzolanic materials such as cement, fly ash, kiln dust, or by using plastics or proprietary chemical encapsulants. Absorption in pozzolanic materials solidifies the waste but does not necessarily fix it and the organic content can be extracted over time. (McFarland and Barnes, 1988).

Processing organic wastes by chemical fixation/solidification appears to still in a treated product that requires a secure landfill for long term disposal and hence falls within the landfill option.

The use of other encapsulants may well succeed in providing non-leachable wastes, however, these still need to be disposed of by landfill.

Incineration

Incineration of organic wastes is used widely and successfully overseas in large central well-controlled operations large enough to destroy efficiently and effectively a range of toxic wastes. (Brotherton et al, 1988, 1989). For incineration to be effective, the organic wastes have to be exposed to high temperatures in an oxidising atmosphere for an adequate length of time. Typically temperatures of greater than 1100 degrees C with dwell times exceeding two seconds are used. Debate continues over the level of emissions and the possible recombination into undesirable compounds of combustion fragments as the flue gas cools.

The scale of operation of such facilities and the capital investment involved requires a substantial rate of feed of toxic material to cover costs. If such a facility were to be constructed in Australia, it could be expected that a wide range of toxic wastes will be mandated to be fed to it.

The ongoing effort to find a suitable site for a major toxic waste incinerator in Australia underlines the difficulty in establishing such a facility. High temperature incineration appears not to be a practicable option for a commercial or small scale waste disposal operation in Australia at the present time.

Carbon Adsorption

Carbon adsorption is a practical, effective and widely used process for removing organic material from wastewater streams. The pesticide content of rinsewaters can be reduced to very low levels. Such treated water could be suit-

* Text of the paper presented at "HAZPAC '91", Cairns, Australia in April, 1991.

able for in-plant re-use especially as part of an overall management plant. Carbon adsorption compacts the waste and substantially reduces its mobility, however, the original mass of toxic material remains and together with the contamination carbon requires disposal. This may be through burial at a secure landfill or incineration at a (future) high temperature incinerator. The reduced volume and mobility as well as the solidifation of the waste may make the overall route attractive. It may also be an appropriate intermediate process allowing waste to be stored safely in anticipation of ultimate disposal.

Biodegradation

Biodegradation has long been recognised as the natural fate of many pesticides in the environment. Active bacteria are present in both soils and groundwater. However, the time required to degrade some pesticides, especially, organochlorine pesticides can be considerable.

Piotrowski (1990) reviewed the application of bacteria in bioremediation, and points out that many contaminated sites have a natural population of bacteria that can degrade the contaminants. He advocates the enhancement of these naturally-occurring bacteria to promote rapid degradation of contamination.

Bioremediation and biodegradation of refractory organics have been carried out successfully in a number of situations of both soil and groundwater contamination. There is growing evidence that bacteria can successfully treat refractory organic compounds and this is becoming a very promising option for treating pesticide rinsewaters. In-plant, land farming and in-situ micro-biological treatment methods are possible future treatment routes, and these may involve enhanced natural or introduced bacteria.

Ultraviolet, Hydrogen Peroxide, Ozone

Ultraviolet radiant energy can disrupt the structure of complex organic molecules and lead to their degradation over time. This concept has been applied to the destruction of pesticides particularly when used in conjunction with active oxygenating oxidants such as ozone and hydrogen peroxide.

Ozone alone is an effective oxidising agent that can attack pesticides (Reynolds, 1989).

Testwork by Jody et. al. (1989) showed significant improvements in the oxidation of hydrazine and related compounds could be achieved with a UV catalysed ozone system over ozone alone.

Sundstrom et. al. (1989) concluded that UV plus hydr gen peroxide was effective in destroying a wide variety hazardous aliphatic and aromatic compounds present in wa at low concentrations. Reaction rates were up to 50 tim faster than with UV light alone.

UV, ozone and hydrogen peroxide systems and comb nations of these systems can destroy a range of organic co pounds, but are less successful with organochlori compounds. The products are often smaller molecules (b perhaps just as toxic) that are amenable to further more co ventional treatment in order to complete "mineralisation Treatment costs to very low levels of contamination can high both in terms of energy costs for UV light and the cos of the oxidising media being used (i.e. ozone or hydrog peroxide).

Overall these techniques show great promise, howeve they are still experimental and could not be said to be com mercially proven technology. Nevertheless, test work to asse their effectiveness can be undertaken at low cost using equi ment supplied by the manufacturers of ozone, hydrogen pe oxide and of UV equipment.

Chemical/Wet Oxidation

Pesticides of long term environmental concern are typ cally very refractory, nevertheless, chemical dissociation ma be possible. For example, certain species may dissociate unde highly alkaline conditions. Even if technically effective, thi approach may result in unacceptable costs due to the quan tity of reagents required to treat dilute organic target solutions

There are a number of innovative processes at the devel opment stage being promoted that generate high levels o chemical reactivity or oxidation to breakdown pesticides Examples are:

* The use of sodium metal for dechlorination of wastes.
* A novel electrochemical approch using the highly oxidising Ag^+/Ag^{++} couple has been described by Steel (1989) as being effective in treating a range of organic wastes including solid wastes.
* A Sydney University process is being developed at the multi-gram scale by Beattie and Kaziro, Brotherton et. al (1988).

A number of water based "wet oxidation" processes have been promoted for treating organic waste streams. These usually require high oxygen pressures and reaction temperatures. Some of these processes use a catalyst to promote the reaction at lower pressures and temperatures than would otherwise be required. Many of the proposed wet oxidation pro-

esses, including the advanced technology supercritical water IODAR process, have been reviewed by Freeman (1986). e comments that wet oxidation processes are very effecve at treating waste streams that are too dilute to incinerate ut too toxic to treat biologically; they do not work "very ell" with chlorinated organics.

Wet oxidation routes have particular application in dilute rocess streams. There appear to be commercial systems in lace (e.g. ZIMPRO, Cannery, 1984) for pressure wet oxiation of dilute waste organic streams, as well as advanced ystems that use extreme conditions that are being developed a pilot plant scale.

euse and Recycle

There is growing emphasis on waste reduction and waste e-use in company waste management programmes as this ay well be the lowest cost option for "waste disposal" (Casedine, 1990, Freeman, 1990).

The limited number of readily available methods for isposal outlined above further emphasises the need to aximise the use of waste recycle and waste managenent. In pesticide production, practices are currently used which capture specific reactor rinsewaters for reuse in later ormulations of similar compounds. In addition, when changng from compounds with specific effect to those with genral effect, less rinsewater needs to be used than in the reverse rogression.

In principal, these concepts could be extended, given ppropriate capture, drainage and segregated storage systems o cater for all plant rinsewaters. If separated between pescide and herbicide, these solutions potentially could be used s general agents in their own right.

Rinsewater management schemes of this kind are low in oth capital and operating cost compared with treatment sysems and have the potential for zero discharge.

There is clear merit in pursuing the concept as far as posible to reduce the volume of waste that needs final treatnent/disposal.

Conclusion

There are a number of innovative processes under develpment that could lead to plant scale treatment processes. However, at the present time the practicable choices for the reatment/disposal of pesticide rinsewaters in Australia appear o be:

* Maximisation of recycle and utilisation;
* Continued disposal (of a reduced volume) to a secure and safe central disposal facility;
* Use of carbon adsorption to reduce the volume of organic waste. This produces a solid waste for disposal and a water stream for in-plant re-use;
* More advanced techniques, such as UV-hydrogen peroxide/ozone and especially biodegradation, deserve experimental support as they are, potentially, able to offer a small scale but effective method for disposal.

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News from Abroad

CUBA PLANS TO DOUBLE NICKEL OUTPUT BY 2000 AD

Cuba has adjusted to the loss of former socialist Eastern European markets by quadrupling nickel sales to developed capitalist countries, and it plans to double nickel output to 100,000 tonnes by the decade's end, a senior industry official said.

"We're going to grow steadily", Mr. Walter Leo, president of the state nickel company, Cubaniquel, told Reuters. Cuba has more than a third of the world's estimated known reserves of nickel. The Cuban industry, based in the north-eastern mining region of Moa, is Cuba's most important export after sugar.

Mr. Leo said Cuba's three existing nickel plants would be modernised and a fourth completed and brought into operation under a $1.2 billion investment plan over the next decade. The development plan, which foresees co-operation with carefully selected foreign partners, would increase the country's nickel production to around 80,000 tonnes by 1996 and to 100,000 tonnes by the end of the decade. Mr. Leo said the Cuban nickel industry had responded successfully to the loss of its traditional markets in Eastern Europe and the former Soviet Union, which up to 1989 together absorbed more than 80 per cent of Cuba's nickel exports.

Cuba's nickel output for export in 1989 totalled 46,600 tonnes, falling to 42,000 and 34,000 tonnes in 1990 and 1991 as the industry absorbed the shock of the collapse of supplies of oil and industrial inputs from the former socialist bloc. Despite this disruption, the sector had managed to replace it lost preferential markets by moving the destination of its exports and increasing hard currency sales to the developed capitalist world. "In the last four years, without counting 1992, we've multiplied by four the quantities exported to capitalist countries," Mr. Leo said. This re-alignment of exports would accelerate in 1992, he added.

The expansion into world markets was mainly to traditional capitalist clients such as West European countries and Canada, Canada bought 8,000 tonnes of Cuban nickel in 1991.

Mr. Leo said this export drive had been successful despite tight U.S. trade and financial curbs against Cuba. But the U.S. curbs were still a brake on Cuba's nickel export potential. Mr. Leo said that Japan, for example, was not buying as much Cuban nickel as it could. Cuba had supplied no nickel to either Russia or other CIS members so far in 1992. Mr. Leo attributed this partly to soaring costs of their industries which hampered agreements on prices.

ALUMINIUM PRICE RECOVERY NOT SOON, SAY ANALYSTS

Aluminium prices are not likely to return to the lows of 1991, but no marked recovery is expected until 1993, London Metal Exchange (LME) broker Billiton-Enthoven Metals Ltd. said.

In Billiton's aluminium update, analysts Angus Macmillan and Karen Norton said the industry had by its own inactions condemned itself to a prolonged period of low prices. They said Western producers were reluctant to cut production sufficiently in response to poor demand, while inventories accumulated against a background of increased shipments by the Commonwealth of Independent States (CIS). When the year started, producers had a six-month "window of opportunity" to return the market to some sort of balance before new capacity coming onstream resulted in production rising again.

RUBBER USERS AGREE WITH GROWERS ON INRA TALKS

Rubber consumer nations have agreed to start early talks with growers on a new rubber pact, a senior International Natural Rubber Organisation (INRO) official said.

"Everybody has indicated good intentions to sit down and discuss a new agreement but there are minor disagreements on procedures to follow", said Mr. Aldo Hofmeister, manager of INRO's buffer stock. "The biggest hurdle has been overcome," he said after a second day of an INRO council meeting in Malaysia.

The current five-year International Natural Rubber Agreement (INRA), which tries to stabilise prices through buffer stock operations, ends in December 1993 and can be extended for a further two years. The United States, one of the largest consumer nations, had earlier voiced objections against an early start of talks to negotiate a new INRA. "Yes, it is a much different climate this time," Mr. Hofmeister said when asked if the agreement by consumers represented a major breakthrough.

"The U.S. indicated it is in favour and this is a good sign," Mr. Hofmeister told reporters. The INRO council groups consist of six producer countries, 20 consumer countries and the European Community.

Malaysia and other producers have said that the current INRA had failed to stabilise prices at levels which would encourage them to remain in production.

Producer and consumer members met separately later following the full council meeting during the day to discuss procedures for the INRA talks. Delegates said the producers, pushing for early talks, have proposed setting up an INRA preparatory committee but consumers wanted to start a working group instead.

STUART L. SCHREIBER — FIRST RECIPIENT OF THE INCEPTIVE THIEME-IUPAC PRIZE IN SYNTHETIC ORGANIC CHEMISTRY

Stuart L. Schreiber is the first recipient of the Thieme-IUPAC Prize in Synthetic Organic Chemistry, as announced recently by Georg Thieme Verlag, the International Union of Pure and Applied Chemistry (IUPAC) and the Editors of Synthesis, Synlett and Houben-Weyl, the initiators of the prize.

The prize, sponsored by Georg Thieme Verlag, carries a donation of DM 10,000. The prize will be presented at an Award Talk on June 29, 1992 at the ICOS 92/CISO 92 in Montreal. Stuart L. Schreiber was born in 1956 in New Jersey, U.S.A. The prize has been awarded to him for his outstanding scientific research achievements in synthetic organic chemistry.

In his work he fuses a striking range of scientific expertise in chemical and biological research and is the leader of a new movement to apply sophisticated chemical synthesis to crucial problems at the frontier of structural, molecular and cell biology. Since 1988 Schreiber has been Full Professor at Harvard University.

The Prize is awarded every two years on the occasion of the International Conference on Organic Synthesis (ICOS) which is being held this year from June 28 to July 2 in Montreal.

Conditions for awarding the prize are that the nominated scientist be under 40 years of age and that his research has had a major impact on the field of synthetic organic chemistry.

News From Japan

SIGNS OF DOWNTURN INCREASING: CHEMICAL BUSINESS SURVEY

While chemical production and shipments in Japan still remain at high levels, there is an increasing downturn tendency reflecting dull business in private housing, passenger cars and consumer electrical appliances, according to the regular quarterly business survey for the January - March period of this year conducted by Japan Chemical Industry Association.

The survey shows that chemical sales in the period saw a standstill trend for the fifth consecutive quarter and the business survey index (BSI) in terms of sales — the ratio of the number of companies replying that they expected "sales growth" to that of those anticipating a "sales drop" — recorded minus 20.8 which is equivalent to the figure registered at the time of the recession of 1986 mainly caused by the appreciation of the yen against the dollar.

As for the employment situation —another indicator of business conditions — the number of companies regarding the number of their employees as "excessive" slightly surpassed that of those answering "short" for the first time in the last seven quarters, indicating an increasing downswing trend.

For future prospects, however, the number of companies expecting business to pick up in and after the October - December period of this year increased, particularly in the lines of petrochemicals and all-round chemical business. Japanese chemical firms have generally good prospects after the last quarter of this year.

The BSI after seasonal adjustment in the first quarter of this year was minus for the third straight period after registering pluses for 18 quarters in a row, with the minus margin increasing.

About 70% of the companies covered by the survey replied that business was "bad", no company answered "good" and slightly more than 20% replied "fairly good". The number of companies (which had already surpassed 50% in the previous survey) replying that operating rates had decreased, increased further, and the number of those answering that their product prices saw a "substantial drop" continued to exceed that of those indicating a "rise".

The number of companies answering that material prices had dropped in the last one year also continued increasing and that of those regarding the export situation as "bad" rose as well. The number of firms which had planned smaller investment in plant and equipment exceeded that of those planning larger investment.

JAPAN'S TOP FLAVOR MAKER PUSHING THRUST IN EUROPE

Takasago International Corporation, Japan's No. 1 flavor-and-fragrance maker, has kicked off the operations of Takasago Europe GmbH, a German subsidiary set up to undertake flavor business with the EC market as target. the Japanese firm also recently completed a flavor research laboratory in Naarden, the Netherlands, which belongs to Takasago Europe Perfumery Laboratory S.A.R.L.

These steps are in line with Takasago's global strategy aimed at deploying flavor-and-fragrance operations in three main regions — Asia, North and South America, and Europe.

The German firm (capitalized at M1 million) located in the suburbs of Koln is engaged in the marketing and development of flavors for soft drinks, chewing gum and candy. It plans to start production in five years' time. It has hired 10 German staff members.

The Japanese firm also started in February 1991 Takasago International (Nederland) B.V. as a wholly owned subsidiary of Takasago Europe Perfumery Laboratory based in Paris. The new Dutch firm has recently completed a research laboratory in Naarden, the Netherlands by investing about Yen 500 million ($3.73 million).

The Dutch laboratory is designed to carry out R&D on fragrances for soap, detergent and other household-use goods in which fragrances have an important role. The Paris-based laboratory has so far conducted research on fragrances for perfumery and eau de Cologne, etc., for European consumers.

MITSUI PETROCHEMICAL TO POST 46% PRETAX-PROFIT DROP

Mitsui Petrochemical Industries Ltd. is expected to report a 46% drop in its unconsolidated pretax profit, totaling some Yen 13.5 billion ($102 million) for the year that ended March 31.

The expected profit is Yen 1.5 billion ($11 million) below the company's earlier projections. Slack demand for chemical products, increased depreciation and distribution costs were behind the profit decline.

Sales are believed to have fallen by Yen 12.8 billion ($0.96 million) to Yen 318 billion ($2.391 million), depressed by a decline in prices because of slowing demand from major customers such as automakers and consumer electronics companies.

Mitsui Petrochemical, faced with slow demand for its products, plans to scale back production further in the first half of the current business year by suspending production at an ethylene plant for three months starting in May.

IMPORTS OF FEEDSTOCK FOR SODA PRODUCTS ALMOST UNCHANGED

Imports of feedstock salt for soda products in 1991 registered 7,530,000 tons, almost unchanged from the previous year, reflecting the stabilization of caustic soda production.

Regarding industrial-use salt imports by country, Mexico 3,250,000 tons (down 6.0%), followed by Australia 3,961,000 tons (down 0.3%), Chile 264,000 tons (up 230.0%), India 55,000 tons (up 96.4%), China zero, and others 1,000 tons (down 66.7%), giving a total of 7,531,000 tons (down 0.6%).

Chinese salt imports exceeded 1,000,000 tons a year around 1970, ranking with those from two other major sources — Mexico and Australia. Reflecting China's domestic demand expansion, however, the 1988 results decreased to zero. In 1989 the dependent ratio on Mexico and Australia reached 98.7%.

Chile has now become the third largest supply sources for Japan since shoring up related infrastructure and solving the quality problem for the product concerned.

SUMITOMO BAYER URETHANE PUTS OFF EXPANDED MDI PLANT OPERATION

Sumitomo Bayer Urethane Co. has decided to postpone planned expanded MDI (diphenylmethane diisocyanate) plant operation by six months after March 1993 at the Ehime factory (Ehime Prefecture).

To meet an increase in demand for MDI, the company originally planed to expand a 37,000-t/y MDI plant to 67,000 t/y November this year.

Besides Sumitomo Bayer Urethane, in Japan Nippon Polyurethane Industry Co., Mitsui Toatsu Chemicals, Inc., Dow Mitsubishi Kasei Ltd., Takeda Badische Urethane, in Korea BASF Korea, Ltd. and Mitsui Kumho are successively considering production capacity expansion plans and as a result, excessive supply was apprehended, while domestic demand declined because of sharp economic slowdown since last year.

Polyurethane resin using MDI as main raw material has continued to show double-digit year-to-year increase centered around interior material for automobiles, bumpers, and heat insulating material for household electrical appliances.

EISAI TO SET UP MARKETING FIRMS IN U.S., EUROPE

Eisai Co. — leading Japanese pharmaceutical producer specializing in ethical drugs — is considering establishing next fiscal year marketing subsidiaries in the United States and Europe. They will handle new products now under development at the company's clinical trial bases in the States and the U.K.

In the U.S., Eisai has put a proton-pump inhibitor (anti-ulcer agent) and an acetylcholinesterase inhibitor (cure for Alzheimer disease) into phase-I and II clinical tests, respectively.

An antiplatelet agent and an antiarrhythmic drug have been subjected to phase-II clinical trials at the company's R&D base in the U.K.

If everything goes smoothly, some of these items will be marketed around 1996 mainly through local business partners, whom the company has yet to select. The planned subsidiaries will handle about 10 - 20% of the new drugs.

DU PONT, OTHER WESTERN FIRMS PUSHING TiO_2 SALES IN ASIA

Major foreign titanium-dioxide makers have been pushing their advances into Asian markets including Japan. They include Du Pont of the U.S., Tioxide belonging to the ICI group, and Australia's SCM Ltd.

Du Pont intends to boost its TiO_2 capacity to 1 million t/y by 1995/1996 (currently 790,000 t/y) with its share of the world market (now 22%) to be raised to 28 - 29% by 2000 by enhancing operations in Asia and Oceania where substantial demand growth is expected.

The American chemical giant began late last year putting into operation a new 90,000-t/y TiO_2 plant in Mississippi, the U.S. and is now building a 60,000-t/y plant in Taiwan for completion next year. The construction of a similar plant is also being planned for South Korea via a joint venture with a Korean firm, with completion set for 1994.

Du Pont has been eager to expand market shares in Japan and other Asian countries by exporting special grades from the U.S. to Japan and shipping commodity type to the rest of Asia. It has been strengthening, especially for Japan, the R&D background at its Yokohama research laboratories to meet the needs of demanding Japanese users.

The size of the Japanese TiO_2 market is now nearly 300,000 tons a year, about 20% of which is held by imports, with about one-half of the imports accounted for by Du Pont's products.

The U.K.'s Tioxide has completed a 50,000-t/y plant in Malaysia. The plant is designed so that its capacity can be raised to 100,000 t/y and the firm is

intent on increasing sales to Japan and other Asian countries. It has been exporting TiO_2 to Japan at the rate of 1,200 t/m and is trying to push exports of its ultrafine TiO_2 to Japan for use in resin and films. It has established an R&D base in the suburbs of Kyoto to develop newer items acceptable to the Japanese market.

MYTEX POLYMERS INCREASES PP COMPOUND SALES IN U.S.

Mytex Polymers Inc. (Texas, U.S.), an equally owned joint venture between Mitsubishi Petrochemical Company Ltd. and Exxon Chemical Co. (U.S.) engaged in polypropylene (PP) compound manufacture, has been making efforts to boost its business activities.

The joint venture has been selling its PP-compound products to Japanese automobile manufacturers branched out into the United States From this year it has been supplying the U.S.'s big-3 auto makers — GM, Ford and Chrysler —on a full scale because its technical service and sales base for American automobile manufacturers established in Detroit have been successfully under way. Mytex Polymers intends to sell a total of 20,000 tons of PP compound this year. The company's sales volume increased favorably to 8,000 tons in 1990 and topped the 10,000-ton level in 1991. Mytex Polymers intends to sell 45,000 tons in 1995 under its medium-term business plan.

THAI BUTADIENE RUBBER PROJECT TO BE JOINTLY EXAMINED

Feasibility studies on commercial production of 25,000 t/y of butadiene rubber (BR) will soon be jointly kicked off by the Bangkok Bank Group of Thailand, Nippon Zeon and C. Itoh (both Japan).

The planned venture will form part of the 2nd-phase national petrochemical project in Thailand. The project is to be implemented in Map Ta Phut with the aim of producing ethylene, propylene, C_4 products including butadiene rubber and aromatics from naphtha and condensate. The 1st-phase project is based on natural gas (ethane). The feasibility studies will be completed within the year and related plant orders will be placed with engineering firms early next.

Implementation of the BR venture has hitherto been put off due to rising equipment costs but they have now decided to inaugurate the feasibility studies since the costs stopped rising further and, what is more, BR demand is smoothly expanding in Southeast Asia in response to start-ups in the area of tire production by world-scale producers including Bridgestone (Japan), Goodyear Tire & Rubber (U.S.) and Michelin (France).

They claim that BR has considerable commercial potentialities since it is hardly produced in the area stretching from Taiwan to India. It is forecast that lower duties will be imposed on the product in line with the envisaged Asian free-trade-zone program.

The BR plant concerned will be put into operation late in 1994 at earliest. The product will be applied to synthetic resins and rubber products as well as auto tires.

OMAN JOINS IN THAI PETROCHEMICAL PROJECT

Oman has contracted to provide 20% of the investment for the \$600-million oil refining project (capacity: 120,000 bbls/d) envisaged for Rayong Province, Thailand by Caltex Petroleum Corp. (U.S.)

There will be shortage of oil-refining capacity in Asia from a middle- and long-term point of view. Construction project for large-scale oil refineries have been worked out one after another in Malaysia, Thailand, Indonesia and Vietnam.

Middle-East oil-producing countries have successively mapped out plans for building in Asia refining facilities and stock bases for oil products, taking into account the growth potential of Asian countries plus an expected decline in oil production in Asia.

Saudi Arabia is conducting feasibility studies on a joint venture in Japan with local interests, i.e. Nippon Oil, Nippon Mining and Arabian Oil. The largest oil-producing country in the Middle East has already invested in a petrochemical project in S. Korea.

MARKETING OF GERMAN CAR PAINTS AGREED ON

Dai Nippon Toryo Co. has acquired from Herberts GmbH (Germany) — a car-paints maker affiliated with Hoechdst — the exclusive marketing rights for repair-use products: the rights are valid only for Japan.

The Japanese firm plans to start marketing the products in May and supply a total of 1,000 t/y three years hence mainly to small-and medium scale car painters.

The German company intends to commission its Japanese counterpart with car-paint production when annual supply reaches about 500 tons. The Japanese firm is considering building up related production facilities within two years at its Komaki factory.

Dai Nippon Toryo — one of the five major Japanese paint makers — is endeavoring to diversify into car-paint operations having a large market size. As a first step, is agreed last year with the German firm with regard to establishing a joint production company for water-thinnable car paints. Formation of the joint venture is now under way at an accelerated pace.

Herberts is the top car-paint maker in Europe but has yet to enter the Japanese market for repair-use products.

New Development from Japan

NEW POLYETHYLENE PROCESS OFFERS WIDER DENSITY RANGE

Mitsui Petrochemical Industries Ltd., and Exxon Chemical Co. (U.S.) have jointly developed a new production method for polyethylene, which combines zirconium-based single-site catalysts (SSCs) and high-polymer designing technology.

The new process is capable of producing polyethylene having a wide range of density (0.88 - 0.96), whereas conventional methods are applied only to production of polyethylene whose density is limited to a narrower range. They intend to widen the density range to 0.86 - 0.98 in the future.

The Japanese company is running a 4,000-t/y pilot plant for "superpolyethylene" at its Iwakuni-Ohtake factory and plans to build a commercial plant depending on the supply-and-demand situation for polyethylene.

The company claims that the new technology facilitates production of polyetheylene having excellent moldability and other properties including shock resistance, transparency and heat-sealing properties.

Exxon Chemical — the world-scale big polyolefin maker (polyethylene: 2 million t/y polypropylene: 400,000 t/y — has inaugurated commercial operation of the new-process plant with the aim of shipping 100,000 t/y of the product in 1994.

INTERNATIONAL STANDARDIZATION FOR FINE CERAMICS DECLARED: NAGOYA MEET

International Conference on the Promotion of Standardization for Fine Ceramics ("ABTT-FC NAGOYA 1992") ended a two day session in Nagoya on April 21, having adopted the "Nagoya Declaration" stressing the necessity for promoting "Early Standardization" regarding fine ceramics through International Organization for Standardization (ISO).

On the basis of the declaration, the Japanese side will approach the ISO positively so that it can take steps to tackle the international standardization at an early stage. Those involved are expected to commence work on the plan by next spring at the earliest, with Japanese Industrial Standards Committee (JISC) acting as a window.

The international meeting was held in accordance with the recommendation for the "Early standardization" in the high-tech fields made in 1990 by Advisory Board on Technological Trends (ABTT), an advisory panel to the Secretary General of International Organization for Standardization/International Electrotechnical Commission (ISO/IEC).

The high-tech fields mentioned above cover fine ceramics, other novel materials, electronics, biotechnology, aerospace and information technology.

The conference had 205 participants from 23 countries who discussed and exchanged views on the promotion of international standardization for advanced ceramics.

M. Uenohara, a representative of the Japanese party, said: "Although many meetings have so far been held as regards standardization, it is the first international conference involving many experts engaged in diverse areas. I believe we've obtained good results including agreements among attendants about certain points on the issues concerned."

Secretary General Dr. L.D. Eicher of ISO comments: "Based on the agreements reached at the meeting, I hope the people involved can deal with the issues satisfactorily. A technical committee within ISO should be set up in the near future."

PUSH IS ON TO PUT PP-BASED CAR BUMPER RECYCLING INTO HIGH GEAR

Japanese auto makers are faced with pressing problems related to recycling of polypropylene (PP) bumpers. R&D efforts are being focussed on recycling of used PP bumpers in the form as the same products.

There is no technical problem with regard to noncoated bumpers but several problems still remain with coated ones, accounting for about 75% of Japan's total supply of car bumpers: the share is far higher than Europe's equivalent of approximately 20%.

Unless the coating is removed from PP bumpers, the result is uneven properties of the recycled products. Synthetic-resin and paint makers are endeavoring to pioneer related peeling-off technology but have yet to develop an adequate one mainly because coating know-how varies with car maker. "The problem will be settled in the near future", says an official at one of the companies concerned.

The most difficult problem facing those involved is how to ensure the profitability of PP-bumper recycling. When used bumpers are collected via scrappers, the recovery cost is boosted since transportation efficiency for the products is very poor: a 4-ton truck is capable of carrying only 500 kg. (120 units) of bumpers.

What is worse, classifying of the used bumpers — this process is needed since the abovementioned peeling-off technology has yet to be established —further raises the total recycling cost.

In Japan, PP deliveries came to 1.8 million tons in 1989, of which 14% was applied to car manufacture. PP occupies a little over 30% of plastic materials for car applications. The size of the Japanese market for PP bumpers stood at about 60,000 tons in 1991.

MICROBE CARRIER BARED

Toray Fine Chemical has pioneered block-shaped cellulose foam usable as a carrier for various microorganisms including molds and actinomycetes. As it is produced from natural material (pulp), it has a high degree of biocompatibility.

The product having numerous fine pores is capable of quickly absorbing about 20 times its own weight of water. It will be used by biotechnology companies and in laboratories.

The foam can resist heat of up to 140°C and no harmful gas is emitted therefrom when it is burnt.

GLASS BALLOONS HELP REDUCE FRP WEIGHT

Glass balloons are being increasingly employed for reducing the specific gravity of fiber-reinforced plastics (FRPs). Dainippon Ink and Chemicals has applied them to high-strength, hybrid sheet molding compound (SMC) and Showa Highpolymer has also used them in the form of floating material for a deep-sea survey ship.

It is necessary to reduce the weight of FRPs if they are to be able to com pete with other lightweight material including aluminum and engineerin plastics. Glass balloons are believed t meet the requirement.

FRP makers are striving to pionee new products incorporating glass bal loons and glass producers are trying t develop glass balloons having highe pressure resistance. FRPs are usuall subjected to press molding, so stron pressure resistance is essential for glas balloons when they are added to FRPs

There are, however, still many tech nical difficulties in blending glass bal loons and FRPs. In general, th mechanical strength — flexural mod ulus in particular — of FRPs wane a the addition of glass balloons increase and it is necessary to uniformly disperse the balloons within the FRPs.

MARKET INFORMATION

Dye intermediates ease

Prices of some dye intermediates have eased in the Bombay Chemicals Market following reduced demand particularly from exporters. However a small increase in the price of aniline oil, resulted in increases in the prices of dimethyl aniline and diethyl aniline. Citric acid continued its decline and was quoted around Rs. 44 per kg.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on June 2, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.25
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	5.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	105.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	6.00
Borax (Granular)	38.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	95.00
Butyl carbitol	110.00
Caustic soda (Flakes)	17.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	4,400.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	180.00

Hydro	60.00
Hyflosupercell	48.00
Hexamine (Resale)	32.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	47.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	200.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	40.00
Phthalic anhydride (Resale)	41.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	72+ST
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	75.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	105+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	17.50
Acetic Anhydride (Resale)	35.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	70.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.0
Benzo trichloride	16.0
Benzoyl chloride	22.0
Bromine Liquid	115.0
Chloroform	65.0
Carbon Tetrachloride	27.0
Cellosolve	70.0
Cyclohexanone	80.0
Cyclohexanol	85+S
Diacetone (Resale)	29.0
Diethyl Oxalate	34.0
Diethyl glycol (DEG) (Resale)	42.0
Dioctyl Phthalate	69.0
Diallyl Phthalate	44.0
Dimethyl Phthalate	48.0
Dioctyl Adipate	58.0
Dibutyl Adipate	42.0
Dipentene	15.0
Dimethylamine 40%	30.0
Dimethylamine 50%	35.0
Ethyl Acetate	27.0
Ethyl Acrylate	92.0
Ethylene Dichloride	21.0
Ethylene Glycol	32.0
Formic Acid (Imp.)	34.0
Formaldehyde (Resale)	7.7
Glycerine (CP)	70.0
Glycerine (IW)	65.0
Hydrogen Peroxide 50% (Resale)	47.0
Isopropyl Alcohol	45.0
Isobutyl Alcohol (Resale)	35.0
Monoethanolamine (Resale)	95.0
Melamine	62.0
Methyl Ethyl Ketone	58.0
Methyl Isobutyl Ketone	60.0
Methyl Acrylate	72.0
Methylene Dichloride (Resale)	30.0

Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	68.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	18.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	19.50
Xylene (Ortho)	32.00

WITHOUT TAX AND EXCISE)

Alphanaphthylamine	81.00
Alpha Naphthol (Imp.)	210.00
Aceto Acetic Ester (Methyl)	140.00
Acetanilide	60.00
Anthraquinone	155.00
Anthranilic Acid	110.00
2-Amino 4-Nitrophenol	150.00
Blue B. Base (Local)	300.00
Beta Naphthol	75.00
Benzidine Dihydrochloride (BDH)	95.00
Bromamine Acid (IDI)	650.00
BON Acid	130.00
CPC (Crude)	110.00
Chicago Acid (Atul)	360.00
Coach Acid	60.00
Cyanuric Chloride (German)	255.00
DEMAP	255.00
2,4-DNCB	29.00
Dichlone (Imp.)	400.00
Dimethyl Aniline	100.00
Diethyl Aniline	175.00
Diethyl Sulphate (Japan)	90.00
Diethyl Sulphate (Local)	78.00
Diamino stilbene disulphonic acid	210.00
3,3-DCB	260.00
Diphenylamine (U.K.)	160.00
Gamma Acid (Atul)	220.00
Gamma Acid (Local)	180.00
H. Acid (Atul)	170.00
G. Salt	78.00
J. Acid	370.00

MPDS (Local)	155
MNA	125.
Meta Ureido Aniline	175.
MPD (Local)	175.
MPD (German)	210.
N-Methyl J. Acid	530.
N-Methyl Aniline	135.
Naphthalene (Refined)	34.
Ortho Anisidine (OA) (Imp.)	108.
Ortho Dichloro Benzene (ODCB)	20.
OT Base	160.
OT Liquid	75.
Para Dichloro Benzene (PDCB)	32.
Para Anisidine (PA local)	145.
PNA	78.
Para Cresidine (Imp.)	330.
Para Amino Azo Benzene (India)	140.
PNCB (HOC)	45.
Para Nitro Toluene	94.
1-Phenyl 3-Methyl 5-Pyrazolone	175.
Phenyl J. Acid	421.0
PT Base	160.0
Rhoduline Acid	615.0
Resist Salt 80%	26.0
Resorcinol	350.0
Sodium Naphthionate	80.0
5-Sulpho-Anthranilic Acid	115.0
Sulphanilic Acid	44.0
Sulpho Tobias Acid	150.0
Tobias Acid (Imp.)	110.0
Metanilic Acid	51.0
MTD (German)	185.0
Vinyl Sulphone	122 .0

Bombay Drugs Market

(Prices as on June 2, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	580
Aluminium Hydroxide IP	43
Ampicillin Sodium	4400
Ampicillin Trihydrate	3400
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2700
Analgin	310
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1450
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium Lactate	30
Calcium D Pantothenate	1500
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2750
Chlorpropamide	235
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3100
Cimetidine	3350
Citric Acid IP	90
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	2000
Diclofenac Sodium	2400
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	350
Disodium Hydrogen Citrate	95
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2650
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	760
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	120
Hydroxylamine HCl	600
Hydroxylamine Sulphate	108
Ibuprofen IP	485
Imipramine HCl	5000
Indomethazine	1075
I.N.H.	375
Inositol IP	1400
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	110
Lactic Acid (Japan)	165
Levamisole	2000
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	160
L. Lysine Pharma Grade	260
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	315
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	325
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	500
Metronidazole Benzoate	490
Morpholine	180
Neomycine Sulphate	4200
Niacin	300
Niacinamide	385
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4700
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	148
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	225
Piperazine Hexahydrate	180
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2100
Pyroxicam	3100
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	260
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	840
Sulphacetamide Sodium	370

Product	Rs./kg
Sulphadoxine	290
Sulphamethoxazole	37
Sulphasomidine	47
Sulphaphenazole	32
Terbutaline Sulphate	3000
Tinidazole	48
Theophylline Anhydrous	41
Thiacetazone	32
Thoridazine HCl	2000
Thycol (Potassium Gluconate Sulphate)	50
Tolbutamide	22
Trifluopromazine HCl	1100
Trifluoperazine HCl	1250
Trimethoprim IP	185
Tween 80	27
Vitamin B6 Hydrochloride	300
Vitamin B2 5-Phosphate	460
Vitamin K-3 (Water soluble)	75

DRUGS INTERMEDIATES

Product	Rs./kg
1-Amino-4-Methyl Piperazine	140
2-Aminopyridine	57
Beta Picoline	23
2-Chloro Propionic Acid	4
2-Chloro Propionic Chloride	8
3-Chloro 4-Fluoro Aniline	137
2:4-Dichloro Benzoic Acid	55
2,6-Dichloro Aniline	77
3,4-Diamino Benzophenone	47
Diethyl Malonate	9
Diethyl Oxalate	3
Dimethyl Acetamide	17
Dimethyl Amino Ethyl Chloride HCl	22
Dimethyl Dichloro Silane	19
Dimethyl Sulphoxide	19
Furoic Acid	16
Isobutyl Benzene	19
Lasamide	95
2,6-Lutidine	180
1-Methyl 1-Amino Methyl Thio 2-Nitro Ethane	155
2-Methyl 5 Nitro Imidazole	18
Methyl Acetoacetic Ester	16
Methyl Chloro Formate	10
Methyl Isothiocyanate	40
Nitromethane	20
N-Butyl Diethyl Malonate	17
N-Methyl Piperazine	85
Ortho Nitro Benzaldehyde	140
Para Chloro Benzoic Acid	15
Para Hydroxy Acetophenone	80
Para Hydroxy Benzoic Acid	14
Para Hydroxy Phenyl Acetamide	180
Pivaloyl Chloride	41
Propionic Anhydride	28

Bombay Dyes Market

(Prices as on June 2, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange 11	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: MAY 29 (NNS) An easy-to-firm tendency was noticed in the local chemicals market during the week under review. Following pressure of offerings of imported goods from Bombay coupled with lack of follow up support, citric acid China suffered a sharp setback and slided down by Rs. 450 at Rs. 4100 per 50 kg. Similarly citric acid Bombay Dyeing, despite restricted supplies, slumped by Rs. 200 at Rs. 5100 per 50 kg. due to slack demand. On nervous unloading by the stockists coupled with weak support from local as well as upcountry buyers, borax granular and boric acid technical were down by Rs. 100 each at Rs. 1600 and Rs. 2800 per 50 kg. respectively. Borax crystal also slumped by Rs. 25 at Rs. 1925 per 50 kg. for want of enquiries. Due to slack demand, naphthalene balls suffered a setback of Rs. 100 at Rs. 2100 per 50 kg. Chatkolite and zinc oxide eased slightly by Re. one at Rs. 71 and Rs. 56/66 per kg. respectively. In the absence of fresh arrivals coupled with zooming support, paraffin wax marked up by Rs. 40 at Rs. 1160 per 50 kg. Likewise slack wax shot up to Rs. 13,500 from Rs. 12,500 per tonne, match wax was quoted at Rs. 17,000 per tonne and residue wax remained firm at its last week closing of Rs. 8300 per tonne. Due to restricted supplies coupled with lack of follow up support from detergent powder manufacturers, trisodium phosphate registered a sharp rise of Rs. 100/125 at Rs. 750/775 per 50 kg. On better stockists support menthol flake, medium and bold quality improved by Rs. 2/5 at Rs. 150, Rs. 270 and Rs. 280 per kg. respectively. Menthol oil marked up by Rs. 5 at Rs. 170 per kg. June-July delivery of menthol oil and menthol flake were quoted at Rs. 165 and Rs. 245 per kg.respectvely. DMO, however, remained firm at its last week closing of Rs. 65 per kg. on scattered support. On better buying support from stockists, titanium dioxide TTP improved by Rs. 2 at Rs. 74 per kg. while due to poor offtake, RC-822 titanium slipped by Re. one at Rs. 95 per kg. Due to tight money market conditions, stockists as well as consumers support in other chemical items were reported thin.

(DELHI MARKET RATES AS ON MAY 29, 1992)

Ammonia Bicarb (Per 25 Kg.)	175.00
Mercury (Per flask)	8,200.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	810/820.00
Citric acid (Per 50 Kg.)	4,100/5,100.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCl (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	415/425.00
Sod. Hydrosulphite (Per Kg.)	55.50/65.00
Rangolite (Per Kg.)	115.00
Safolite (Per Kg.)	79.00
Chatkolite (Per Kg.)	71.00
Decolite (Per Kg.)	96.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,800.00
Paraffin Wax (Per 50 Kg.)	1,160.00
Slack wax (Per metric tonne)	13,500.00
Tartaric Acid (France Per Kg.)	490.00
Borax Granular (Per 50 Kg.)	1,600.00
Borax Crystal (Per 50 Kg.)	1,925.00
Sodium Nitrite (Per 50 Kg.)	725/800.00
Sodium Nitrate (Per 50 Kg.)	530.00
Camphor Thal (Per Kg.)	138.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	280.00
Menthol Medium (Per Kg.)	270.00
Menthol Flake (Per Kg.)	250.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	170.00
Glycerine (Per Kg.)	65.00/70.00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.00
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	43.50/44.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (per 50 Kg.)	750.00/775.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	74.00
Titanium Dioxide RC-822 (Per Kg.)	95.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	N.A.
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	56.00/66.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	31.75/32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,100
Match Wax (Per tonne)	17,000.00
Residue Wax	8,300.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

Prices are showing a tendency to come down. Business is dull and enquiries are poor. On the export front Indian leather is facing stiff competition from other countries and hence offtake from leather industries is slack. Citric prices have come down to Rs. 80 on better availability and with the peak seasonal demand being over. Caustic and soda ash prices were stable maintaining previous levels.

(MADRAS MARKET RATES AS ON MAY 30, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.00
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	45.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	16.00
Barium Chloride (per kg)	14.00
Bleaching Powder (per 50 kgs)	300.00
Borax (per kg)	32.00
Boric Acid (per kg)	64.00
Calcium Chloride Solid (per kg)	4.00
Calcium Chloride Anhydrous (per kg)	6.75
Calcium Carbonate (Activated) (per kg)	8.00
Calcium Carbonate (Precipitated) (per kg)	7.00
Caustic Soda Flakes (per kg)	17.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	38.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.00
Ferrous Sulphate Crystal (per kg)	5.00
Hydros (TCPL) (per kg)	57.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	43.00
Hyflosupercell (per kg)	48.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	28.00
Magnesium Chloride (per kg)	4.00
Magnesium Sulphate (per kg)	3.00
Mercury (per 34.5 kgs)	8,000.00
Nickel Chloride (per kg)	200.00
Nickel Sulphate (per kg)	200.00
Phosphoric Acid (per kg)	37.00
Potassium Carbonate (per kg)	34.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	30.00
Soda Ash (TAC) (per 75 kgs)	520.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	17.00
Sodium Nitrate (per kg)	10.00
Sodium Sulphite (per kg)	14.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.00
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	27.00
Trisodium Phosphate (per kg)	16.00
Titanium Dioxide (Anatase) (per kg)	68.00
Titanium Dioxide (Rutile) (per kg)	100.00
Zinc Chloride (per kg)	22.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	14.50

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	36.00
Acetic Acid (per kg)	22.00
Acid Slurry (per kg)	38.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	80.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	67.00
Glue Flakes (per kg)	18.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	280.00
Oxalic Acid (per kg)	17.00
Pentaerythritol (per kg)	66.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	185.0
Phthalic Anhydride (per kg)	44.0
Sodium Acetate (per kg)	14.0
Sodium Alginate (per kg)	250.0
Sorbitol (per kg)	27.0
Urea (Technical) (per kg)	4.0

SOLVENTS

Acetone -- HOCL (per kg)	33.0
Benzene (per litre)	22.5
Butanol (per kg)	60.0
Butyl Acetate (per kg)	52.0
Carbon Tetra Chloride (per kg)	28.0
Cellosolve (per kg)	75.0
Chloroform (per kg)	35.0
Diacetone Alcohol (per kg)	46.0
Diethylene Glycol (per kg)	42.0
Di-butyl Phthalate (per kg)	66.0
Di-octyl Phthalate (per kg)	72.0
Ethyl Acetate (per kg)	27.0
Isopropyl Alcohol (per kg)	44.0
Methanol (per kg)	14.0
Methylene Chloride (per kg)	28.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	58.00
Octanol (per kg)	80.00
PEG 400 (per kg)	75.00
Perchloroethylene (per kg)	40.00
Propylene Glycol (per kg)	66.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	37.00
Toluene (per kg)	24.00
Xylene (per kg)	32.00

CALCUTTA MARKET
(Prices as on May 31, 1992)

Acetic acid (per 50 kg)	725.00
Basic chrome sulphate (per 50 kg)	850.00
Benzene (litre)	14.00
Bleaching powder (bag)	230.00
Borax granular (per 50 kg)	NA
Boric acid (per 50 kg)	2,750.00
Camphor (per kg)	92-94.00
Caustic soda solid	NA
Caustic soda flakes (per 50 kg)	800.00
Glycerine (per kg)	52.50
Menthol bold (per kg)	285.00
Menthol medium (per kg)	325.00
Menthol small (per kg)	275.00
Phosphoric acid (per 50 kg)	1,400.00
Phenol (per kg)	42.00
Soda ash (75 kg)	395.00
Sodium bichromate (per 50 kg)	3,250.00
Sodium bicarbonate (per 50 kg)	375.00
Sodium nitrate (per 50 kg)	450.00
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.00
Trisodium phosphate (per 50 kg)	375.00
Toluene (litre)	18.00

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Bentonite

Svenska Forshammar AB, Molnalsv. 24, P.O. Box: 14216, S-400 20 Goteborg, Sweeden. Tel: 4631-351300; Fax: 4621-405382; Telex: 22029 FORSHAM S.

Chemical Products

Quideco C.A., Attention: Ronaldo Fredin, Ave. Anton Philips, Zona Industrial La Hamaca, Santa Rosa, P.O. Box: 1204, Maracay, Estado, Aragua, Venezuela. Tel.: 043-546011; Fax: 043-548376; Telex: 48201.

Hydrochloric acid

Plasticlor S.A. de C.V., Prol. Calle 16 No. 69, San Pedro de Los Pinos, 01180 Mexico, D.F., Mexico. Tel.: 5-2716597, 5-5163934; Fax: 5-2718102; Telex: 1761116 EBAG ME.

Sulphuric acid, caustic soda

Acidos Y Solventes S.A. de C.V., Carlos B. Zetina No. 2, Fracc. Industrial Xalostoc, 55360, Ecatepec de Morelos, Estado de Mexico, Mexico. Tel.: 5-7551145, 5-7550915; Fax: 5-755-0945.

Calcium chloride, sodium sulphate

Quimica Gramar C.A., Attention: Jesus A. Arreaza E., Calle Madrid entre Veracruz y, Caroni. Qta. Marylu, Las Mercedes, P.O. Box: 61833, Caracas, Venezuela. Tel.: 922632; Fax: 915009; Telex: 45502.

Manganese oxide

Minerales Exclusivos y Cia, S.C.A., Carrera 5° No. 12-49 Sur, P.O. Box: 44448, Santafe de Bogota, D.C., Colombia. Tel.: 7813351, 7812670; Fax: 7816579.

Sodium Sulphate

Protuctos Quimicos Monterrey S.A., Mirador No. 201, Mirador 64070, Monterrey, N.L., Mexico. Tel.: 83-456569, 83-456509; Fax: 83-423606; Telex: 382677 PROQY ME.

Ethylene oxide

Productora de Alcoholes Hidratados C.A., Attention: Melvyn Mc Intyre, Ave. Principal Los Crotijos de Lourdes, Edf. Centro Senderos, Piso 1°, Ofc. 107B, P.O. Box: 3654, Caracas, Venezuela. Tel.: 2383426; Fax: 2035926.

Paints

Pinco Pittsburgh S.A., Attention: Sra. Julieta Galea A. Plaza La Castellana, Edf. Iasa, Piso 3°, La Castellana, Caracas, Venezuela. Tel.: 2-2631493, 2-263-0469; Fax: 2-2631621.

Pinturas International C.A., Attention: Sr. Antonio Serino, Ave. Francisco de Miranda, Edf. Parque Cristal, Torre Oeste, Piso 6°, Caracas, Venezuela. Tel.: 2-2850311; Fax: 2-2843430.

Polystyrene

Dow Quimica de Colombia S.A., Transversal 18 No. 78-80, P.O. Box No. 75240, Santafe de Bogota, D.C., Colombia. Tel.: 2568800; Fax: 6104892. Telex: 44635 DOW CO.

Polyester resins

BASF Quimica Colombiana S.A., Calle 100 No. 51-44, P.O. Box 5751, Santafe de Bogota, D.C., Colombia. Tel.: 2714455, 2718804; Fax: 2715126; Telex: 44667.

Polyurethane

Productos Flexibles C.A., Profeca, Attention: Moises Tisminesky S., Reducto A Municipal, Edf. Saverio Russo, Piso 10°, Ofc. 101, Caracas, Venezuela. Tel: 4833683; Fax: 4832976.

Copper sulphate

Quimica Gramar C.A., Attention: Jesus A. Arreaza E., Calle Madrid entre Veracruz y Caroni, Qta. Marylu, Las Mercedes, P.O. Box 61833, Caracas, Venezuela. Tel.: 922632, Fax: 915009, Telex: 45502.

Acetic acid

Comerico Industrial Internacional S.A. de C.V., Tenayuca No. 64, Farcc. Industrial San Nicolas 54030, Tlalnepantla, Estado de Mexico, Mexico. Tel.: 5-3906655, 5-5658379; Fax: 5-390-5803.

Tartaric acid

Raw Materials Inc., Attention: Teofilo Suarez H, Departamento Comercial Calle Manuel Maria Icaza No. 15, Ave. Samuel Lewis, P.O. Box: 4493, Panama 5, Panama. Tel.: 635333.

Natural dyestuffs

J & B Wholesalers, Attention: Martin Stone, 5, Cutwil House, 104, Smith Street, Durban 4001, South Africa. Phone: 031-370654.

Colouring matters for textiles and leather

Oriental Giant Dyes & Chemical Ind. Corp., Attention: K.S. Chiago, Rm. 601, 6th Floor, No. 111, Chung-Sun N. Road, Sec. 2, Taipei 10450, Taiwan ROC. Tel.: 02-5311936, 02-5625311; Fax: 02-5513784; Telex: 25285 OGDYES.

Epoxide resins, liquid

Dow Quimica de Colombia S.A. Transversal 18 No. 78-80, P.O. Box No. 75240, Santafe de Bogota, D.C., Colombia. Tel: 2568800; Fax: 6104892; Telex: 44635 DOW CO.

EXPORT OPPORTUNITIES

Antracite

Aicello Taiwan Ltd., 53, Lan Chou St., Taipei, Taiwan ROC. Tel.: 8862-591-8140; Fax: 8862-5966441.

Boric acid

Edith Paz Munoz Ltda., Mirador Azul, Sector Industrial La Florida, Santiago, Chile. Tel.: 2213332; Telex: 2941466 SOLDI CL.

Pigments

Plasticel S.A., Ave. Adolfo Lopez Mateos No. 4200 Nte., 66480 San Nicolas de Los Garza, N.L., Mexico. Tel.: 83-518687, 83-518995; Fax: 83-518-711; Telex: 383150 PLAS ME.

Insecticides

Suleiman M.M. Al Sawadi Est., P.O. Box: 8305, Jeddah 21482, Saudi Arabia. Fax: 6893463.

Polyvinyl chloride

Condutrade Internacional S.A. de C.V., Miguel de Cervantes Saavedra No. 255, Ampliacion Granada 11520 Mexico, D.F., Mexico. Tel.: 5-2505077, 5-2505300; Fax: 5-2509151.

Polyurethane resin

Comermoda S.A. de C.V., Dickens No. 20-A, Chapultepec Polanco, 115-60 Mexico, D.F., Mexico. Tel.: 5-5403100, 5-5203672; Fax: 5-520-8759.

Kaolin

Cartonajes Estrella S.A. de C.V., Poniente 122 No. 430, Industrial Vallejo, 02300 Mexico, D.F., Mexico. Tel.: 5-3680033; Fax: 5-5670434; Telex: 1773423 CESA ME.

Chlorine

Millipore Iberica S.A., Ave. Llano Castellano, 13, 28034 Madrid, Spain. Tel.: 91-7290300; Fax: 91-7292909; Telex: 23545.

Mercury

Beckman Instruments Espana S.A., Ave. Llano Castellano, 15, 28034, Madrid, Spain. Tel.: 91-7291666.

Metallic mercury (non-treated)

BM International, 6, Rafi Plaza, 8, Davis Road, Lahore 54000, Pakistan. Fax: 9242--302307.

Hydrochloric acid

Riso S.A., C/ Salustiano Oloz, 6, 28001, Madrid, Spain. Tel.: 91-275-5600.

Caustic soda

Celulosa de Chihuahua S.A. de C.V., Centro Agroindustrial Anahuac S/N, Anahuac, 31600 Cd. Cuauhtemoc, Chih., Mexico. Tel.: 158-50327, 158-50319; Fax: 158-50733; Tele[illegible] 349895 CECHI ME.

Calcium carbonate

Plasticel S.A., Ave. Adolfo Lop[illegible] Mateos No. 4200 Nte, 66480 San Ni[illegible]olas de Los Garza, N.L., Mexico. Te[illegible] 83-518687, 83-518995; Fax: 83-51[illegible]711; Telex: 383150 PLAS ME.

Calcium carbide, potassium chlori[illegible]

Cometal S.A., C/ Jose L. Galdian[illegible] 4, 28016 Madrid, Spain. Te[illegible] 91-4034500; Telex: 27351.

Methanol

Celco S.A. de C.V., Paseo de L[illegible] Palmas No. 765601, Lomas de Chapu[illegible]tepec, 11000 Mexico, D.F., Mexic[illegible] Tel.: 5-5403280; Fax: 5-5404775.

Polyethylene

Aba S.A. de C.V., Carr. Mexic[illegible] Toluca No. 2974, Lomas de Vista He[illegible]mosa 05100 Mexico, D.F., Mexic[illegible] Tel.: 5-5706033, 5-5706224; Fa[illegible] 5-5706033; Telex: 1762315 ABA M[illegible]

PVC resins

Acs International S.A. de C.V., Av[illegible] Ruiz Cortines No. 1855 Pte, Estrell[illegible] 64400 Monterrey, N.L., Mexico. Tel[illegible] 83512622, 83514850; Fax: 83-31178[illegible]

SEMINARS/FORTHCOMING EVENTS

Seminar on **Advances in Polyurethanes and Urethane-Based IPN Elastomers and Coatings,** 7-8 October, 1992, Hotel International, Basel, Switzerland.

Seminar on **Fiber Optic Sensor Technology and Smart Structures Applications,** 20-21 October, 1992, Copthorne-Gatwick Hotel, London, England.

Seminar on **Hydrogels: Specialty Plastics for Biomedical and Pharmaceutical Applications,** 22-23 October, 1992, Hotel International, Basel, Switzerland.

Seminar on **Technology and Applications of Polysaccharides,** 29-30, Oct., 1992, Basel Hilton, Switzerland.

Second Annual International Conference on Textile Coating & Laminating, 9-10 November, 1992, Zurich Hilton, Zurich, Switzerland.

Seminar on **Advances in Polyme[illegible] Blends,** 26-27 November, 199[illegible] Copthorne-Gatwick Hotel, Londo[illegible] England.

For detailed seminar agendas and reg[illegible]istration information contact:

Programme Division, Technomi[illegible] Publishing AG, Missionsstrasse 4[illegible] CH-4055 Basel, Switzerland. Tele[illegible]phone No.: 061/435226. Fax No.: 061[illegible] 435259.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Food & Drugs Laboratory, Attn: Joint Commissioner, (Testing), Near Polytechnic, Vadodara 390 002.	Laboratory reagents, chemicals, etc.		FDL/P/Chem/ T-11/92-93	20.6.92
Indian Petrochemicals Corpn. Ltd., Attn: Sr. Materials Manager Maharashtra Gas Cracker Complex Division, Nagothane, Dist. Raigad, Maharashtra.	Isobutyl alcohol	4 MT	GCC/MM/92/ 50/5042	23.6.92
	Phosphoric acid - IS-798	10 MT	50/5037	"
	UHP Nitrogen gas cylinders	130 Nos.	50/0032	"
	UHP Hydrogen gas cylinders	480 Nos.	"	"
	Catalyst C1	6 MT	51/5006	23.6.92
	Catalyst C2	15 MT	"	"
	Catalyst C5	15 MT	"	"
	Urea (IS-5406)	50 MT	50/5039	23.6.92
National Aluminium Co. Ltd., Attn: General Manager (Materials), IDCO Tower, 8th Floor, Janpath, Bhubaneshwar 751 007.	Caustic soda	30,000 MT	NBC/MM/01/ GTN-92/01	25.6.92
(Tender forms are also available at their offices at Calcutta, Bangalore, Bombay, Visakhapatnam, New Delhi and Madras.)				
Oil & Natural Gas Commission, Attn: General Manager (MM), Bombay Reg. Business Centre, 3-B, Vasudhara Bhavan, Bandra (East), Bombay 400 051.	Chemical for removal of scale and deposit	6000 Kgs.	BRBC/DBG/SP/ CHEM/1 (46)/ 92/OT-114	25.6.92
	Scale inhibitor chemical for water maker	5,300 Kgs.	CHEM/1 (47)/ 92/OT-115	"
	Engine jacket cooling water treatment chemical	5,000 Kgs.	CHEM/1 (49)/ 92/OT-116	29.6.92
Steel Authority of India Ltd., Attn: Chief Materials Manager, Salem Steel Plant, Salem 636 013, Tamil Nadu.	HF acid	225 MT	PU 225-0799	26.6.92
	Burnt lime	600 MT	PU 325-0147	30.6.92
(Tender forms are also available at their New Delhi and Madras offices)				
Tilam Sangh, Unit of Rajasthan State Co-op. Oilseed Grower Fed. Ltd. Attn: General Manager Bikaner Project, 33, Bicchwal Industrial Area, Bikaner 334 002, Rajasthan.	Caustic soda flakes (98%)	150 MT	35/92-93	10.6.92
	Liquid caustic solution (47%)	150 MT		
	Hydrochloric acid (35%)	130 MT		
	Phosphoric acid (85%)	30 MT		
	Sulphuric acid (98%)	125 MT		
	Citric acid (99%)	5 MT		
	Bleaching earth, acidic (95%)	200 MT		
	Activated carbon (Decol powder min. 50 mgm/gm)	50 MT		
	Common salt	5 MT		
	Soda ash	1 MT		
	(Percentages given in brackets is the minimum requirement)			

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
National Aluminium Co. Ltd., Attn: General Manager (Materials), IDCO Tower, 8th Floor, Janpath, Bhubaneshwar 751 007.	Caustic soda	20,000 MT	NBC/MM/01/ NIT-92/01	25.6.92

(Tender forms are also available at their offices at Calcutta, Bangalore, Bombay, Visakhapatnam, New Delhi and Madras.)

PLANT & EQUIPMENT OFFERS FOR SALE

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
The Fertilizer Corporation of India Ltd., Attn: Addl. Chief Engineer, (Disposal Cell), Sindri Unit, P.O. Sindri 828 122, Dist. Dhanbad, Bihar.	1. Rock phosphate grinding Plants (Two streams) 2. 360 TPD phosphoric acid plant 3. 1100 TPD triple super phosphate plants (3 streams) 4. TSP product handling & bagging plant		FCIS/SALE/PAP-TSP/92/61	31.7.92

TRANSPORT

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
E.I.D. Parry (India) Ltd., Attn: General Works Manager, Post Box No. 2, ETS Post, Ennor Thermal Station P.O., Ennore, Madras 600 057.	Transportation of bagged fertiliser, gypsum and calcium carbonate (in bulk) by trucks from Ennore factory to various destinations in South India.			15.6.92

INTERNATIONAL BULK CHEMICAL PRICES

SPOT PRICES AS ON MAY 13, 1992

Product		European Price range	US Price range
Naphtha		$190-192m.t. (cif)	
Gasoil		$181-182/m.t. (cif)	
Propane			30-30.5 cts/gal (fob)
Butane			35.5-35.75 cts/gal (fob)
Ethylene		$390-400/m.t. (cif)	14.5-15.5 cts/lb (del)
Propylene —	Chemical grade	DM600-620/m.t. (cif)	13-14 cts/lb (del)
	Polymer grade	DM640-650/m.t. (cif)	14.5-15 cts/lb (del)
Butadiene		$220-230/m.t. (fob)	12-13 cts/lb (cif)
Benzene		$360-365/m.t. (fob)	$1.19-1.20/gal (fob)
Toluene		$290-305/m.t. (fob)	93-95 cts/gal (fob)
Xylenes —	Virgin	$290-300/m.t. (cif)	
	Solvent	$290-300/m.t. (fob)	90-92 cts/gal (fob)
Para-xylene		$375-385/m.t. (fob)	18-19 cts/lb (fob)
Ortho-Xylene		$375-385/m.t. (fob)	17-18 cts/lb (fob)
Styrene —	T1	$480-490/m.t. (fob)	
	T2	$505-515/m.t. (fob)	19.75-20.25 cts/lb (fob)
Methanol —	T1	$95-100/m.t. (cif)	
	T2	DM170-185/m.t. (fob)	36-38 cts/gal (fob)
MTBE		$340-345/m.t. (fob)	85-88 cts/gal (fob)
INORGANICS			
Caustic soda		$240-260/m.t. (fob)	$250-265/m.t. (fob)
Soda ash		$180-190/m.t. (fob)	$145-170/m.t. (fob)
POLYMERS			
LDPE	Film grade	$690-730/m.t. (fob)	$705-750/m.t. (fob)
LLDPE	Butane-based	DM1.00-1.05/kg (del)*	$620-660/m.t. (fob)
	Hexene-based	DM1.10-1.15/kg (del)*	
	Octene-based	DM1.55-1.70/kg (del)*	
HDPE	Blow-moulding	$640-690/m.t. (fob)	$660-700/m.t. (fob)
	Inj. moulding	$620-660/m.t. (fob)	$620-680/m.t. (fob)
PP	homo-injection	$660-700/m.t. (fob)	$660-680/m.t. (fob)
	copolymer	DM1.15-1.30/kg (del)*	40-46 cts/lb (del)*
PS	general purpose	$665-725/m.t. (fob)	$680-690/m.t. (fob)
	high impact	$690-750/m.t. (fob)	$730-740/m.t. (fob)
PVC	general purpose	$430-450/m.t. (fob)	$550-590/m.t. (fob)

* Contract price

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx. sailing dt. (5)
			JNPT PORT (NHAVA SHEVA)	
7/6	Bagatel	C.M.B.	Dar Es Salaam; Mombassa (Direct); Kampala; Blantyre; Lusaka; Ndola; Matwara; Lilongwe and all inland destinations in E. Africa. (Carting at Kalamboli CFS).	11/6
			BOMBAY PORT	
9/6	Ever Bridge (Pan) (Voy-616)	Greenways	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon; Manchester; Avonmouth; Bremen; Belfast and all destinations in U.K.; Germany; Switzerland; Austria & Scandinavian ports. (Carting at F-PD).	12/6
		Arebee/	P. Said; Alexandria; Piraeus; Venice; Trieste;Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Revenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). Carting at M.O.D. No. 1).	
		M.C S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapest; Russia. (Carting at M.O.D. No. 2).	
		POL India	Thames Port (London); Manchester; Liverpool; Birmingham; Hamburg; Bremen; Rotterdam; Antwerp; Le Havre; Gdynia; Gdansk; Aarhus; Copenhagen; Oslo; helsinki; Malmao; Gothenburg; Other Poland Inland destinations; Genoa; Naples; Valencia; Izmir; Marseilles; Barcelona; Alexandria; Lattakia; Mersin; Damietta; Beirut; Haifa; Ashdod. (Carting at Timber Pond No. 3).	
		J. Mackintosh/	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
		P&O	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at T.P. No. 4).	
16/6	Lanka Asitha (V-46/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. and Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	19/6
11/6	Kota Petani	J. Mackintosh	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Crtg. at Frere Basin No. 2).	14/6
10/6	Ravidas	S.C.I.	Aden	15/6
13/6	Indira Gandhi	Transocean	Antwerp; Rotterdam; Trabzon; Odessa & Black Sea Ports. (Carting at 5-VD).	15/6
15/6	Tibor Szamuely (Rus)	Transocean	Illyichevsk; Odessa; Izmail Reni (USSR), Russe (Bulgaria); Galatz (Romania); Budapest (Hungary); Bratislava (Czechoslovakia); Pancevo; Belgrade/ Beograde (Yugoslavia); Linz; Vienna (Austria); Deggendorff; Regensborg (West Germany). (All Ports on River Danube). (Carting at N/O & G-PD).	17/6
10/6	Vishva Bandhan	S.C.I.	Hodeidah; Aden; Mukalla.	15/6
3/7	Robert E Lee	M.S.P.L.	Assab. (Carting at P/Q-PD)	3/7
11/6	Kota Petani	J. Mackintosh	Baghdad via Aqaba. (Carting at Frere Basin No. 2).	14/6
3/6	Ermioni	Jades Ship	Sharjah.	12/6
10/6	Hafez	J.M. Baxi	Bandar Abbas; Bandar Khomeini	15/6
4/6	Sea Wind	I.L.S.A.	Dubai.	10/6
11/6	Kota Petani	Trident	Tema/Lome; Lagos; Matadi; Lobito; Luanda; Freetown; Cotonou; Douala; P. Harcourt; Abidjan; Monrovia; Dakar. (Carting at 12B-ID).	14/6

(1)	(2)	(3)	(4)	(5)
9/6	Ever Bridge (V-616) (Pan)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sacramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas; various inland destinations. (Carting at EF-PD).	12/6
		Marine Trans/	South & Central American Pots.. (Carting at E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; New Orleans; Oakland; San Francisco. (Carting at M.O.D. No. 2).	
		Arebee/	Halifax; Montreal; Toronto; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas; Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tiuana; Veracruze; Mexico; Sao Francis Do Sul; Carribbean; Central and South American Ports. (Carting at M.O.D. No. 1).	
		P&O	New York; Baltimore; Norfolk; Savannah; Charleston; Houston and South American Ports. (Carting at T.P. No. 4 for P&O).	
18/6	Stamford (V-41 W/E)	Samrat	Longbeach; Oakland; Seattle; Los Angeles; San Francisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; Vancouver; Montreal; Toronto; New Orleans; Houston. (Carting at B-PD).	20/6
8/6	Vega (Voy-36 A/B)	O.S.A.	New York; Philadelphia; Baltimore;Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma & S. American & W. Indies Ports. (Carting at B. Pier Extn.).	13/6
		Contfreight/	New York; Wilmington; Charleston; Baltimore; Savannah; Norfolk; Philadelphia; Los Angeles; San Francisco; Oakland; Seattle. (Only FCL). (Carting at Frere Basin).	
		U.L.A.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; West Indies Ports. (Carting at B-PD).	
7/6	Hoegh Clipper (Voy-0212)	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Savannah; Wilmington; Philadelphia; Baltimore and FCL Houston; New Orleans; Chicago; Milwaukee; Atlanta; Dallas; Tampico; Mexico City; Veracruz; San Louis Potossi. (Carting at Hay Bunder No. 5).	10/6
11/6 17/6	Kota Petani/ (V-2205) Trade Fast (Voy-FAS-001)	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orleans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American & Pacific Ports. (Carting at B-PD).	14/6 20/6
		Trident	S. American; Caribbean and Central American Ports. (Carting at 12B-ID).	
3/7	Robert E Lee (USA)(Voy-65)	M.S.P.L.	Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	3/7
11/6 17/6	Kota Petani/ (V-2205) Trade Fast (Voy-FAS-001)	J. Mackintosh/ Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 2 for J. Mackintosh) (Carting at 12B-ID) for Trident)	14/6 20/6
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P.No. 3).	
		M.C.S./	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari	Melburne; Sydney; Brisbane. (Carting at F.B. No. 3).	
10/6	Vishva Kaumudi	S.C.I.	(Seychelles); P. Louis; Reunion;. (Carting at B. Pier Extn.).	15/6
15/6	Allamanda (V-004)	G.O.S.	P. Louis; Re Union; (Tamatave). (Carting at F.B. No. 1).	21/6
18/6	Stamford (V-41 W/E)	F.F.C. Co./	Colombo. (Carting at Timber Pond No. 1).	20/6
		Silvership	Chittagong; Rangoon. (Carting at Frere Basin No. 1).	
11/6	Kota Petani	J. Mackintosh	Colombo; Chittagong; Rangoon. (Carting at Frere Basin No. 2).	14/6
10/6	Vishva Prafulla	S.C.I.	Colombo.	14/6
15/6	Tibor Szamucly	Transocean	Karachi (Afghanistan). (Carting at N/O-PD & G-PD).	17/6

(1)	(2)	(3)	(4)	(5)
9/6	Ever Bridge (V-616)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at F-PD).	12/6
		M.C.S.	Far East & Japan Ports. (Carting at M.O.D. No. 2).	
18/6	Stamford (V-41 W/E)	F.F.C. Co./	Singpaore; Jakarta; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at T.P. No. 1).	20/6
		Samrat	Singapore; (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok;; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo; Haipong; Ho Chi Minh City. (Carting at B-PD).	
8/6	Vega (V-36 A/B)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Carting at B. Pier Extn.).	13/6
		M.S.P.L./	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Surabaya. (Carting at F.B. No. 5&6).	
		Contfreight/	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Only FCL). (Carting at Frere Basin).	
		U.L.A.	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese Ports. (Carting at B-PD).	
11/6	Kota Petani (V-2205)	J. Mackintosh/	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang; Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Battar;	20/6
17/6	Trade Fast (V-FAS-001)		Yokohama: Nagoya; Kobe; Ho Chi Minh; Main Chinese Ports. (Carting at Frere Basin No. 2).	20/6
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 12B-ID).	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at B-PD).	
		Silver Ship/	Far East Ports. (Carting at F.B. No. 1).	
		Beacon/	Far East Main Japan & Chinese Ports. (Carting at E-Shed Grain Depot).	
		Lucky Mari	Singapore; Penang; P. Kelang; Bangkok; Manila; Surabaya; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kahosiung; Keelung; Busan; & Chinese Ports. (Carting at F.B. No. 3).	
4/6	Pravdinsk	Transocean	Singapore; Main Japan Ports; Vladivostock.	15/6
3/7	Robert E Lee	M.S.P.L.	Singapre; P. Kelang. (Carting at P/Q-PD).	3/7

KANDLA PORT

(1)	(2)	(3)	(4)	(5)
6/6	Ibn Al Haitham	Transworld	Gulf; U.K. Cont.; U.S. East & West Coast; Med. & West African Ports.	10/6
7/6	Orient Ganges (V-547)	Meridian/ Worldwide/	Dubai; Muscat; Baghdad; Sharjah; Abu Dhabi; Basrah; Ajman; Fujairah; Doha; Bahrain; Salallah; Samawah; Umm Qasr; Najaf Diwaniyah.	10/6
		Sai Ship/	Dubai; Abu Dhabi; Sharjah; Muscat.	
		O.S.A./	U.S.A.; Far East; Australia; New Zealand ports.	
		Beacon/	U.S.A.; Mediterranean; Far East; Middle East.	
		Sea Land	Gulf; U.K., Cont.; U.S. East & West Coast and Med. Ports.	
		U.L.A.	Dubai; Aden; Hodeidah.	
		Merzario/	Gulf; U.K.; North Cont.; Scandinavian; Med.; USA; & W. African Ports	
		Velji P. & Son		
		Seafreight	U.S.A.; Med.; Far East; Middle East and West Africa.	
Stream	Tropicana	Sai Ship	Jeddah; Aqaba; P. Sudan	10/6
5/6	Kostroma	Parekh	Jeddah; Aqaba.	15/6

VESSELS DUE FOR IMPORT DISCHARGE (BOMBAY)

Due Date	Steamer's Name	Agents	From
12/6	Hoegh Dyke (V-0613)	Patvolk	U.S.A./Canada/Jeddah
11/6	Kota Petani (V-2205)	J. Mackintosh/Trident/E.S.P.L./ Contfreight	Far East/Red Sea/East Africa
10/6	Ravidas	S.C.I.	U.K. Cont.
12/6	S/o. Tripura	S.C.I.	Japan/Far East
15/6	Tibor Szamuely (V-127)	Transocean	Russia & E. Europe
10/6	Vishva Prafulla	S.C.I.	Canada/USA
10/6	Vishva Mohini	S.C.I.	U.K. Cont.

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

MATERIALS IMPORTED BOMBAY (30.4.92)

(Continued from previous issue)

DIMETHYL TEREPHTHALATE: From Spain: Ester Inds. Ltd., 50 Mts., Rs. 7,11,512. Garware Plastics & Polyester Ltd., 60,000 Kgs., Rs. 9,58,243.

DIOCTYL PHTHALATE: From Belgium: Softplast Pvt. Ltd., 16.4 Mts., Rs. 4,81,814. From France: Bhor Inds. Ltd., 33.600 Mts., Rs. 9,60,452. From Germany: National Leather Cloth Mfg., 64,640 Kgs., Rs. 14,85,850.

DL 2 AMINOBUTANOL: From Germany: Lupin Laboratories Ltd., 15,210 Kgs., Rs. 35,53,434.

D V ESTER: From Japan: United Phosphorus Ltd., 11,000 Kgs., Rs. 79,64,023.

D V ESTER METHYL: From USA: Ankur Agrochem Pvt. Ltd., 680 Kgs., Rs. 4,64,689.

ETHEPHON TECH: From USA: Bhopal Pesticides Pvt. Ltd., 3,014 Kgs., Rs. 10,05,236.

ETHOXYMETHYLENE MALONIC ACID ESTER: From China: IPCA Labs. Ltd., 1,000 Kgs., Rs. 3,14,387.

ETHYL ACETATE: From Netherlands: Punjab Anand Lamp Inds., 600 Lts., Rs. 72,342.

ETHYLENE BIS-STEARYL-AMIDE: From Netherlands: ABS Plastics Ltd., 13,000 Kgs., Rs. 4,99,825.

ETHYLENE DIAMINE: From USA: Jay Chemical Inds., 12,700 Kgs., Rs. 8,26,950.

ETHYLENE OXIDE: From UK: Sandoz India Ltd., 32,000 Kgs., Rs. 16,00,754.

2 ETHYL HEXANOIC ACID: From Germany: Ranbaxy Laboratories Ltd., 4,440 Kgs., Rs. 2,20,190.

2 ETHYL HEXYL ACRYLATE: From Korea: Monali Traders, 6,800 Kgs., Rs. 1,96,085.

ETHYL LACTATE: From Netherlands: Peico Electronics & Elect. Ltd., 100 Ltrs., Rs. 14,578.

2 ETHYL THIO ETHANOL: From France: Euro Asian Industries, 2,200 Kgs., Rs. 1,35,805.

FERRIC OXIDE: From Sweden: Cosmo Ferrites Ltd., 40 Mts., Rs. 5,39,937.

FORMIC ACID: From Germany: Euro Asian Industries, 60,480 Kgs., Rs. 9,77,040.

FORMIC ACID 85%: From Germany: Dataram & Sons, 20,160 Kgs., Rs. 3,33,406. From UK: Paks Trade Centre, 20,160 Kgs., Rs. 4,03,391.

GERANIUM OIL: From China: Earnest Co., 2,000 Kgs., Rs. 18,73,899. From Germany: Jindal Dye Intermediates Pvt. Ltd., 1,160 Kgs., Rs. 9,36,834.

GLYOXAL 40%: From Japan: Unichem Labs. Ltd., 16,000 Kgs., Rs. 5,22,823.

GUANYL THIOUREA: From Japan: Torrent Pharmaceuticals Ltd., 2,100 Kgs., Rs. 9,02,236.

HARMLESS CHEMICALS: From Japan: Apte Amalgamations Ltd., 1,20,000 Kgs., Rs. 1,02,90,566.

HYDROGEN PEROXIDE 50%: From Belgium: Aarti Drugs Pvt. Ltd., 20,640 Kgs., Rs. 3,60,157; From China: Rupal Chemical Inds. Pvt. Ltd., 15,960 Kgs., Rs. 2,94,005.

HYDROQUINONE: From China: Satyadev Chemicals Pvt. Ltd., 2 Mts., Rs. 2,18,329. From France: Nitson Labs., 12,000 Kgs., Rs. 12,60,858.

HYDROXYACETIC ACID: From USA: Searle Ind. Ltd., 21,450 Kgs., Rs. 6,02,673.

HYDROXYLAMINE SULPHATE: From Japan Shamrock Pharmaceuticals, 10 Mts., Rs. 4,44,654. From USA: Cibatul Ltd., 36 Mts., Rs. 13,09,716.

HYDROXY QUINALDINE 4 CARBOXYLIC ACID: From Germany: Jaysynth Dyechem Ltd., 2.040 Mts., Rs. 15,60,277.

8 HYDROXY QUINOLINE: From Japan: Phar East Labs. Ltd., 500 Kgs., Rs. 2,30,585.

IODINE CRUDE MIN. 99.8%: From Belgium: G. Amphray Laboratories, 14,000 Kgs., Rs. 40,01,887.

IODINE CRUDE 99.5% MIN: From China: Lub Chem, 500 Kgs., Rs. 1,64,321.

IODINE CRUDE: From Japan: Lub Chem, 1,000 Kgs., Rs. 3,04,331.

ISOBUTYL BENZENE: From China: Ajmera Housing Corpn., 13,600 Kgs., Rs. 10,45,870

ISOCYANATE: From USA: Marathon Footwears Pvt. Ltd., 1,000 Kgs., Rs. 66,698.

ISOPARAFFINIC HYDROCARBON: From USA: ONGC, 90 Nos. Rs. 1,02,474.

ISOPHTHALIC ACID: From Italy: Bakelite Hylam Ltd., 17,500 Kgs., Rs. 5,72,073.

ISOPHYTOL: From Germany: E. Merck (India) Ltd., 5,950 Kgs., Rs. 26,34,590.

ISOPROPYL ALCOHOL: From Taiwan: Ariane Orgochem Pvt. Ltd., 12,800 Kgs., Rs. 2,64,996; Wockhardt Ltd., 12,800 Kgs., Rs. 2,61,210.

L-BASE: From China: Espee Chemicals, 500 Kgs., Rs. 10,24,446.

L-CARVONE: From Mexico: Vikshara Trading & Investment Ltd., 3,000 Kgs., Rs. 13,67,243.

LEMON OIL: From Italy: Nirma Ltd., 1,000 Kgs., Rs. 8,79,455.

LINALOL: From France: Zaib Trading Co., 900 Kgs., Rs. 1,23,347.

LINEAR ALKYL BENZENE: From China: Vam International, 122.30 Mts. Rs. 31,15,379. Vimal Detergent Cake Pvt. Ltd., 54,400 Mts., Rs. 13,82,239

LITHIUM CARBONATE: From Yugoslavia: Torrent Lab Ltd., 237 Kgs. Rs. 1,01,683.

MALEIC ANHYDRIDE: From Japan: Salvi Chemical Inds. 18 Mts. Rs. 3,10,584.

MELAMINE: From Korea: Bagadia Optical & Plastic Inds. 36 Kgs. Rs. 1,673.

MERCURY 99.99%: From Spain United Phosphorus Ltd., 6,900 Kgs. Rs. 6,98,742.

META NITRO PARA TOLUIDINE: from UK: Sudarshan Chemicals Inds. Ltd., 2,925 Kgs., Rs. 6,25,203.

METHACRYLIC ACID: From Japan: Thermax Ltd., 4,940 Kgs., Rs. 2,80,947.

3 METHOXY-4 HYDROXY BENZALDEHYDE BENZOPYRONE: From China: U.K. Paint Inds., 12 Mts., Rs. 11,57,213.

METHYL ACETOACETATE: From USA: Kopran Ltd., 17,760 Lbs., Rs. 3,73,214; From USA: Torrent Pharmaceuticals Ltd., 15,336 Kgs., Rs. 6,20,380.

METHYLENE CHLORIDE: From France: Shamrock Pharmaceuticals Pvt. Ltd., 19,760 Kgs., Rs. 2,91,833.

METHYLENE CHLORIDE: From Netherlands: Apte Amalgamations Ltd., 1,59,120 Kgs., Rs. 22,96,815; From UK: Anant & Co., 49,820 Kgs., Rs. 6,54,333; Chemox Marketing Associates Pvt. Ltd., 117.660 Mts., Rs. 16,07,958.

METHYLENE DIANILINE: From Japan: Intec Polymers Pvt. Ltd., 1,000 Kgs., Rs. 1,11,472.

METHYL GLYCOL: From Germany: Bakelite Hylam Ltd. 16,000 Kgs., Rs. 4,64,633.

MICROCRYSTALLINE WAX: From Spain: India Crafts, 12,000 Kgs., Rs. 2,83,693.

MONO ETHANOLAMINE: From Japan: Meghdoot Plastic Corpn., 12,000 Kgs., Rs. 3,15,215.

N-ACETYL SULFANILYL CHLORIDE: From Korea: Jaysynth Dyechem Ltd., 50,000 Kgs., Rs. 42,33,088.

NAPHTHENIC ACID: From Belgium: Alpha Chemie, 14,440 Kgs., Rs. 5,02,487.

NEOPENTYL GLYCOL: From Germany: Ajmera Housing Corpn., 13,500 Kgs., Rs. 3,36,206.

N N DIMETHYL ANILINE: From Japan: Ravi Chem Dye, 15.600 Mts., Rs. 7,43,208

NORMAL PARAFFINS: From Italy: Reliance Inds. Ltd., 2,422.942 Mts., Rs. 3,04,32,012.

OCTYL TIN: From Germany: Caprihans India Ltd., 6,160 Kgs., Rs. 12,06,679.

OLEYL CETYL ALCOHOL: From Germany: ICI India Ltd., 40.800 Mts., Rs. 22,35,942.

OPIUM ALKALOID CRUDE: From USA: Alkaloids Corpn., 4,000 Kgs., Rs. 24,01,535.

ORGANIC SURFACE ACTIVE AGENT: From Germany: Century Enka Ltd., 2,000 Kgs., Rs. 2,66,401; From Italy: Pasupati Acrylon Ltd., 50 Mts., Rs. 34,992. From Sweden: Meghdoot Plastic Corpn., 12,000 Kgs., Rs. 3,42,662.

ORTHANILIC ACID: From Japan: Jansons International, 2,000 Kgs., Rs. 6,04,161.

ORTHO NITRO TOLUENE: From Korea: Toshniwal Exports, 13.8 Mts., Rs. 2,12,240.

ORTHO TOLUIDINE: From China: Priya Chemicals, 2,400 Kgs., Rs. 94,140.

ORTHO TOLUIDINE LIQUID: From Germany: Satyadev Chemicals Pvt. Ltd., 15.200 Mts., Rs 6,81,115; Sudha Industrial Corpn., 14.400 Mts., Rs. 6,33,101.

PARA CHLORO BENZOIC ACID: From Japan: Cadila Laboratories Ltd., 1,800 Kgs., Rs. 3,64,816.

PARA CHLORO BENZYL CYANIDE: From Japan: Ankur Agrochem Pvt. Ltd., 1,320 Kgs., Rs. 3,14,235.

PARACHLOROTOLUENE: From Italy: Chemcrux, 10,984 Kgs., Rs. 4,66,942; From Japan : Rallis India Ltd., 16,000 Kgs., Rs. 7,24,151.

PARAFORMALDEHYDE 96% PRILLS: From Spain: Colour Chem Ltd., 18,000 Kgs., Rs. 2,88,708.

PARAFORMALDEHYDE: From Spain: Jindal Dye Intermediate Pvt. Ltd., 1,20,000 Kgs., Rs. 16,19,282.

PARA NITRO CHLORO BENZENE: From France: Triochem Products Ltd., 58,320 Kgs., Rs. 18,62,824; From Germany: Bayer (India) Ltd., 7,250 Kgs., Rs. 2,25,143; Kamal Traders, 38.880 Mts., Rs. 11,48,957; Rohini Chemicals Pvt. Ltd., 18 Mts., Rs. 5,43,745; Toshniwal Exports, 18,000 Kgs., Rs. 5,58,975; Triochem Products Ltd., 72,000 Kgs., Rs. 23,42,372; From Italy: A.P. Chemicals, 30.720 Mts., Rs. 9,58,193; Dinesh Chemicals Pvt. Ltd., 15,360 Kgs., Rs. 4,54,278; Vivid Exports Pvt. Ltd., 15,360 Kgs., Rs. 5,24,437.

PARA NITRO TOLUENE: From China: Jeevan Oxychem Products, 16 Mts., Rs. 6,47,241; New Coal Tar Chemicals Mfg. Co. Ltd., 6,200 Kgs., Rs. 2,67,091; Vasant Chemicals Pvt. Ltd., 32 Mts., Rs. 15,05,332; Vipul Dyes & Chemicals Pvt. Ltd., 5 Mts., Rs. 2,32,906. From Germany: Vasant Chemicals Pvt. Ltd., 15.840 Mts., Rs. 6,92,778.

PENTA ACID: From Denmark: Ranbaxy Labs. Ltd., 8,987.200 Nos. Rs. 46,91,371.

PENTAERYTHRITOL: From Sweden: U.K. Paint Industries, 37 Mts., Rs. 10,49,664.

PHENOL: From UK: Viral Laminates Pvt. Ltd., 26,620 Kgs., Rs. 4,99,964; Visnagar Taluka Audyogic Sahak, 62.920 Mts., Rs. 11,81,734.

PHENOL CRYSTALS: From UK: Bakelite Hylam Ltd., 96 Mts., Rs. 19,66,214.

PHENOL PURITY 99.5% MIN: From Japan: Caprihans India Ltd., 48,000 Kgs., Rs. 10,67,170.

PHENOL USP: From USA: Sundex India Ltd., 5 Kgs., Rs. 11,44,540.

PHENYL XYLYL ETHANE: From Japan: Hind Condensor Ltd., 10,000 Kgs., Rs. 5,71,698.

PHTHALATE PLASTICIZERS: From Korea: Northern India Cloth Mfg. Co. Ltd., 16 Mts., Rs. 4,30,058.

PHTHALIC ANHYDRIDE: From Korea: Accron Industries, 14,800 Kgs., Rs. 3,19,643.

PIPERAZINE ANHYDROUS: From Sweden: Plant Org. Ltd., 7,200 Kgs., Rs. 17,37,962.

PIVALOYL CHLORIDE: From France: Tini Pharma Pvt. Ltd., 7,920 Kgs., Rs. 9,41,083.

POLY CARBONATE: From Netherlands: Autolite India Ltd., 5,000 Kgs., Rs. 5,01,716.

POLYETHYLENE GLYCOL: From Germany: Anil & Co., 16,330 Kgs., Rs. 5,31,263.

POLYTETRA FLUORO ETHYLENE: From Japan: Duelon Polymers Pvt. Ltd., 1,675 Kgs., Rs. 4,83,986.

POLYVINYL ALCOHOL: From Japan: Anishkumar & Co., 5,700 Kgs., Rs. 3,38,647; Ashok Fashion Fabrics Pvt. Ltd., 960 Kgs., Rs. 55,477; Hira Industries, 7,000 Kgs., Rs. 4,00,189; India Crafts, 2,500 Kgs., Rs. 1,31,339; From Japan: Macnair Exports Pvt. Ltd., 12 Mts., Rs. 7,09,810; Meghdoot Plastic Corpn., 30,000 Kgs., Rs. 17,15,094; The Simplex Mills Co. Ltd., 1.800 Mts., Rs. 94,564; From USA: The Mafatlal Fine Spg. & Wvg. Mills, 6,750 Kgs., Rs. 3,54,617.

PROCAINE HYDROCHLORIDE: From China: Allembic Chemical Works Co. Ltd., 3,000 Kgs., Rs. 10,48,113.

PROPIOPHENONE: From Taiwan: Wockhardt Ltd., 6,000 Kgs., Rs. 6,74,319.

PYRIDINE: From Japan: Apte Amalgamations Ltd., 12,870 Kgs., Rs. 14,36,769; Ranbaxy Labs. Ltd., 10,000 Kgs., Rs. 12,70,440; From USA: Nitson Laboratories, 4,000 Kgs., Rs. 4,85,037.

PYRIDINE 2 DEGREE: From USA: Cibatul Ltd., 3,800 Kgs., Rs. 4,24,226.

PYRIDINE HYDROBROMIDE: From UK: Max India Ltd., 8,000 Kgs., Rs. 11,91,486.

RANGOLITE: From Taiwan: India Crafts, 2.8 Mts., Rs. 1,30,919.

RESORCINOL: From Japan: Devarsons Pvt. Ltd., 7,500 Kgs., Rs. 10,71,934.

ROCK PHOSPHATE: From Jordan: Albright Morarji & Pandit, 53.910 Mts., Rs. 12,060; From Morocco: The Dharamsi Morarji Chemicals, 1,120 Mts., Rs. 25,06,820.

SELENIUM DIOXIDE: From Japan: Cipla Ltd., 1,000 Kgs., Rs. 3,65,123.

SILICA PRECIPITATED: From Germany: Premier Rubber Mills, 1,475 Kgs., Rs. 40,413; Swastika Enterprises, 19,150 Kgs., Rs. 6,00,350; Tirubala Exports, 29,325 Kgs., Rs. 9,34,903.

SILICONE OIL: From USA: Hico Products Ltd., 2,000 Kgs., Rs. 4,44,654.

SODA ASH: From Kenya: Ballarpur Industries Ltd., 546 Mts., Rs. 24,44,497.

SODIUM ACID PYROPHOSPHATE: From Germany: Procter & Gamble India Ltd., 1,050 Kgs., Rs. 53,358.

SODIUM BICHROMATE: From Germany: K. Patel Chemo Pharma Pvt. Ltd., 7,500 Kgs., Rs. 1,81,249.

SODIUM FORMALDEHYDE SULPHOXYLATE: From China: Raj Carpets, 19.5 Mts., Rs. 4,05,882.

SODIUM LAURYL ETHER SULPHATE: From UK: Hertz Chemical Pvt. Ltd., 4.360 Mts., Rs. 79,265.

SODIUM METHOXIDE: From Germany: Hindustan Chem Inds., 18,500 Kgs., Rs. 17,31,996.

SODIUM MONOFLUOROPHOSPHATE: From UK: Godrej Soaps Ltd., 6 Mts., Rs. 5,76,720.

SODIUM TRIPOLYPHOSPHATE: From Taiwan: Continental Chemicals Ltd., 136 Mts., Rs. 28,07,673; Vam International, 289 Mts., Rs. 59,66,305.

STEARIC ACID: From Malaysia: Carona Ltd., 2,125 Kgs., Rs. 33,492; Pix Transmissions Ltd., 5 Mts., Rs. 92,901; Ralson India Ltd., 3,600 Kgs., Rs. 57,684.

STYRENE MONOMER: From Netherlands: Pidilite Industries, 7,525 Kgs., Rs. 1,92,724.

SULPHUR: From UAE: The Natural Gas Co. Pvt. Ltd., 38 Mts., Rs. 96,060.

TEREPHTHALIC ACID: From Japan: JCT Fibres Ltd., 924 Mts., Rs. 1,46,53,478.

TERTIARY BUTANOL: From Japan: Gharda Chemical Ltd., 6,820 Kgs., Rs. 2,52,447.

TETRA POTASSIUM PYROPHOSPHATE: From Germany: Procter & Gamble India Ltd., 3,000 Kgs., Rs. 1,38,160.

THIOUREA: From China: Jindal Dye Intermediate Pvt. Ltd., 40,000 Kgs., Rs. 14,44,733; Rhur Chemicals Pvt. Ltd., 2,400 Kgs., Rs. 97,716; From Japan: Dipak Labs Pvt. Ltd., 2,400 Kgs., Rs. 1,48,641; Euresian, 4,000 Kgs., Rs. 2,24,773; H.N. Chem Inds. Pvt. Ltd., 1,600 Kgs., Rs. 99,095; Wadhwa Pharmochem Pvt. Ltd., 4,000 Kgs., Rs. 2,41,384.

TITANIUM DIOXIDE: From Germany: JCT Fibres Ltd., 9,625 Kgs., Rs. 6,92,031; From Japan: Carona Ltd., 6.65 Mts., Rs. 2,75,997; Mahalaxmi Fabric Mills Ltd., 7,325 Kgs., Rs. 3,74,787; From Singapore: Carona Ltd., 8.350 Mts., Rs. 3,90,188; Polynova Industries Ltd., 6 Mts., Rs. 3,09,670; From Spain: Prince Plastics, 4,825 Kgs., Rs. 2,52,857.

TOLUENE: From Indonesia: Wockhardt Ltd., 1,800 Kgs., Rs. 30,76,838.

TOLUENE DI ISOCYANATE 80/20: From USA: Nufdam Inds., 9,500 Kgs., Rs. 6,23,675.

TRICHLOROETHYLENE: From Japan: Rallis India Ltd., 39,440 Kgs., Rs. 7,14,012.

TRIMELLITIC ANHYDRIDE: From USA: Intec Polymers Pvt. Ltd., 10,000 Kgs., Rs. 8,14,802.

TRIMETHOXY BENZALDEHYDE: From China: Orex Pharma Pvt. Ltd., 2,000 Kgs., Rs. 14,31,450.

TRI 2 (HYDROXY ETHYL ISOCYANURATE): From Japan: Intec Polymers Pvt. Ltd., 2,175 Kgs., Rs. 1,92,537.

VINYL TRI METHOXY SILANE: From USA: The Indian Aluminium Cables Ltd., 390 Kgs., Rs. 1,40,699.

YELLOW SULPHUR: From Bahrain: Jaishil Sulphur & Chem Inds. 42 Mts., Rs. 1,26,091; Kanhaiya Chemicals, 42 Mts., Rs. 1,26,091; From Iran: Metazinc (India) Ltd., 8,059.060 Mts., Rs. 2,14,21,438; Rama Petrochemicals Ltd., 335 Mts., Rs. 8,77,223; From Saudi Arabia: Century Textiles and Industries Ltd., 3,983 Mts., Rs. 1,09,61,862; The Dharamsi Morarji Chemical Co., 8,000 Mts., Rs. 2,24,99,328; The Indian Link Chain Mfg. 1,914 Mts., Rs. 53,28,550; Metazinc (India) Ltd., 10,845.130 Mts., Rs. 3,04,55,992; The National Rayon Corpn., 6,000 Mts., Rs. 1,62,37,653;

Nirma Limited., 4,978 Mts., Rs. 1,43,30,453; Raheja Sulphur Ltd., 3,000 Kgs., Rs. 85,47,688; Rama Petrochemicals Ltd., 11,755 Mts., Rs. 3,40,06,961.

ZINC OXIDE: From China: Ralson India Ltd., 14,400 Kgs., Rs. 4,34,491; Zenith Rubber & Plastic Works, 7.9 Mts., Rs. 2,15,677.

ZINC OXIDE: From France: Enkay India Rubber Co. Pvt. Ltd., 9,450 Kgs., Rs. 3,50,901; Navyug India Ltd., 5,000 Kgs., Rs. 1,64,174.

ZINC OXIDE: From Korea: Ceat Ltd., 64,880 Kgs., Rs. 25,44,908; Govind Rubber Ltd., 17 Mts., Rs. 6,74,921; From Singapore: Carona Ltd., 3.500 Mts., Rs. 1,22,146; From USA: Precision Rubbers Inds. Pvt. Ltd., 1,247 Kgs., Rs. 1,37,652.

ZINC SULPHATE: From China: Armour Chem Ltd., 3,800 Kgs., Rs. 72,415.

DRUG MATERIALS IMPORTED BOMBAY 30.4.92

ALPHA PHENYL GLYCINE CHLORIDE HYDROCHLORIDE: From Netherlands: Deepharma Ltd., 1,976 Kgs., Rs. 14,79,766.

AMINO PENICILLANIC ACID: From Denmark: Ranbaxy Laboratories Ltd., 5,000 Kgs., Rs. 1,00,84,120; From Sweden: Ranbaxy Laboratories Ltd., 5,000 Kgs., Rs. 1,01,15,881.

6 AMINO PENICILLANIC ACID: From Denmark: Ranbaxy Laboratories Ltd., 5,000 Kgs., Rs. 1,00,84,119; From Netherlands: Kopran Ltd., 475 Kgs., Rs. 7,61,112.

AMPICILLIN TRIHYDRATE BP: From Oman: Maneesh Pharmaceuticals, 3,060 Kgs., Rs. 56,78,921.

ANALGIN DAB: From China: Hoechst India Ltd., 10,000 Kgs., Rs. 24,69,180.

ANALGIN DAB 8: From China: Paam Pharmaceuticals, 2,400 Kgs., Rs. 5,83,147; Unichem Laboratories Ltd., 1,000 Kgs., Rs. 2,83,924.

CHLOROQUIN PHOSPHATE BP 80: From China: Marvel Laboratories Pvt. Ltd., 700 Kgs., Rs. 4,59,688.

CIMETIDINE USP: From UK: Cadila Labs Ltd., 400 Kgs., Rs. 6,27,919.

D-ALPHA PHENYL GLYCINE CHORIDE HYDRO CHLORIDE: From Netherlands: Ranbaxy Laboratories Ltd., 11,550 Kgs., Rs. 84,32,368.

D(-) ALPHA PHENYL HYDROXY PHENYL GLYCINE: From Netherlands: Kopran Chem Co. Ltd., 3,000 Kgs., Rs. 18,51,886; Lyka Labs Ltd., 1,300 Kgs., Rs. 7,68,960.

DIOSGENIN: From China: Wyeth Laboratories Ltd., 940 Kgs., Rs. 13,19,606.

FURAZOLIDONE BP 80: From China: Bombay Pharma Products, 740 Kgs., Rs. 1,63,705.

HYDRAZINE HYDRATE: From USA: Aarti Drugs Pvt. Ltd., 4,800 Kgs., Rs. 2,25,694; From USA: Ymer Labs., 16,000 Kgs., Rs. 9,65,535.

HYDRAZINE HYDRATE 80%: From USA: Aarti Drugs Pvt. Ltd., 5,000 Kgs., Rs. 2,35,097; Nitson Laboratories, 5,000 Kgs., Rs. 2,72,529.

INDOMETHACIN BP 88: From China: Mazada International Pvt. Ltd., 225 Kgs., Rs. 1,19,979.

MANNITOL USP: From Brazil: Chetan Chem Co., 2 Mts., Rs. 1,10,325.

METRONIDAZOLE BP 88: From China: Manjarati Chemicals, 3,200 Kgs., Rs. 13,65,930.

METRONIDAZOLE BP 88: From Hong Kong: Manjarati Chemicals, 3,500 Kgs., Rs. 17,67,500.

PARACETAMOL BP 88: From China: Falma Lab Pvt. Ltd., 5,000 Kgs., Rs. 8,09,906.

PENICILLIN: From Netherlands: Gujarat Lyka Organics Ltd., 3,418.22 Kgs., Rs. 25,63,300.

PENCILLIN G POTASSIUM: From Germany: Max India Ltd., 20,000 Nos., Rs. 1,04,99,260; From Germany: Max India Ltd., 10,000 Units, Rs. 65,74,528; Sol Pharmaceuticals Ltd., 6,330 Kgs., Rs. 56,28,199; From Hong Kong: Lupin Laboratories Ltd., 9,000 Kgs., Rs. 56,02,642; From Netherlands: Gujarat Lyka Organics Ltd., 6,836 Kgs., Rs. 55,05,452; Lyka Labs Ltd., 5,000 Nos., Rs. 23,91,323; From UK: Cadila Laboratories Ltd., 3,240 Box, Rs. 14,97,900.

PROMETHAZINE HCL BP 88: From China: Sevantilal & Sons, 200 Kgs., Rs. 1,87,390.

SULPHADIAZINE: From China: Hindustan Ciba Geigy Ltd., 1,500 Kgs., Rs. 4,95,472.

TETRACYCLINE HCL: From Austria: Hindustan Antibiotics Ltd., 10,000 Kgs., Rs. 58,55,929; From China: Aurochem Laboratories, 1,500 Kgs., Rs. 7,95,375.

TETRACYCLINE HCL BP 88: From China: Karimjee Ltd., 975 Kgs., Rs. 4,96,856.

TETRACYCLINE HCL BP 80/88: From Germany: La Curé Pharmaceuticals Pvt. Ltd., 3,050 Kgs., Rs. 14,26,136.

THEOPHYLLINE ANHYDROUS BP: From China: FDC Ltd., 2,275 Kgs., Rs. 5,01,979.

VITAMIN B2 BP 80: From China: Harman Finochem Pvt. Ltd., 1,000 Kgs., Rs. 14,92,767.

DYES & DYE INTERMEDIATES IMPORTED BOMBAY (30.4.92)

ACETO ACETIC METHYL ESTER: From Japan: Anar Chemical Inds., 3,400 Kgs., Rs. 1,88,978.

ACETYL SULPHANILYL CHLORIDE: From Japan: Mayur Dye Chem Inds., 5,000 Kgs., Rs. 4,28,843.

4-B ACID: From Korea: Highland Dye Works, 170 Kgs., Rs. 17,415.

BETA NAPHTHOL: From China: Beta Int-Nat., 31,500 Kgs., Rs. 15,50,731; Gamma Colours Ltd., 34.5 Mts., Rs. 17,31,293. H and H International, 16 Mts., Rs. 6,51,443; Jeevan Products, 35 Mts., Rs. 13,78,276; Jindal Dye Intermediate Pvt. Ltd., 81,000 Kgs., Rs. 33,09,753; Priya Electronics & Chemicals, 33,000 Kgs., Rs. 16,56,019; Sunbeam Monochem Pvt. Ltd., 16,500 Kgs., Rs. 7,39,311; Vapi Products Inds, 16,000 Kgs., Rs. 8,17,506; Vivid Exports Pvt. Ltd., 16.5 Mts., Rs. 8,64,693; From Hong Kong: Gamma Colours Ltd., 13.075 Mts., Rs. 6,74,822; Priya Chemicals, 16,500 Kgs., Rs. 8,62,073; Priya Electronics & Chem Ltd., 82,500 Kgs., Rs. 43,10,366; From Poland: Mardia Chemicals Ltd., 32,000 Kgs., Rs. 14,33,814.

BON ACID: From China: Dalal Enterprises, 7,675 Kgs., Rs. 7,05,620.

BROMAMINE ACID: From Germany: Western Chem Co., 1,997 Kgs., Rs. 7,89,267.

DISPERSE DYES YELLOW: From Germany: Banswara Syntex Ltd., 7,75,000 Kgs., Rs. 3,05,824.

DISPERSE DYES: From Germany: C.M. Textiles Pvt. Ltd., 600 Kgs., Rs. 6,64,182.

DISPERSE DYES: From Germany: C.M. Textiles Pvt. Ltd., 1,000 Kgs., Rs. 12,22,960; Himson Knitting Inds. Ltd., 60 Kgs., Rs. 74,818; Mitesh Bros., 600 Kgs., Rs. 7,19,180; Orkay Silk Mills Ltd., 100 Kgs., Rs. 51,186. Surat Fashions Ltd., 500 Kgs., Rs. 4,95,876.

DISPERSE VIOLET: From China: Madalasa International Ltd., 1,000 Kgs., Rs. 3,10,542.

DYE INTERMEDIATES: From Japan: Jansons International, 2,800 Kgs., Rs. 10,77,610; Jansons International, 16,250 Kgs., Rs. 6,00,750; Kokan Synthetics, 16 Mts., Rs. 4,70,062; Shyam Intermediates, 16 Mts., Rs. 6,96,201; From Taiwan: Jindal Dye Intermediate Pvt. Ltd., 2,600 Kgs., Rs. 9,74,428.

DYES: From Germany: Anishkumar & Co., 600 Kgs., Rs. 4,31,401; Ashok Fashion Fabrics Pvt. Ltd., 175 Kgs., Rs. 1,80,186; Ashok Fashion Fabrics Pvt. Ltd., 325 Kgs., Rs. 4,93,439.

DYE SOLUTION: From UK: Anishkumar & Co., 550 Kgs., Rs. 1,56,076.

DYESTUFFS FORON: From Sweden: Rajasthan Textile Mills, 1,000 Kgs., Rs. 8,05,169.

IRGALITE BLUE: From UK: United Ink & Varnish Co. Ltd., 800 Kgs., Rs. 3,13,546.

METHYL ACETO ACETIC ESTER: From Japan: S M Dyechem Ltd., 16 Mts., Rs. 7,40,544.

N ACETYL SULPHANILYL CHLORIDE: From Japan: Mayur Dye Chem Inds., 15,000 Kgs., Rs. 12,86,530.

OPTICAL WHITENING AGENT: From Germany: Modern Emporium, 30 Kgs., Rs. 30,419.

ORTHO ANISIDINE: From China: Monarch Dyestuffs Inds., 24,000 Kgs., Rs. 52,05,201; Nandosal Inds., 16,000 Kgs., Rs. 14,22,893; From Indonesia: Aarti Organics Ltd., 1,191 Kgs., Rs. 1,22,696.

PALANIL BLUE 5 GE 88: From Japan: Garden Silk Mills Ltd., 500 Kgs., Rs. 4,70,053.

PARA ANISIDINE: From China: Monarch Dyestuffs Inds., 13,000 Kgs., Rs. 15,44,552; Nanavati Services & Trades Pvt. Ltd., 2,000 Kgs., Rs. 1,57,607; Nandosal Inds., 12,000 Kgs., Rs. 10,71,729.

PIGMENTS: From Germany: Premier Vinyl Flooring Ltd., 1,000 Kgs., Rs. 50,684.

RANGOLITE DS: From Germany: Surat Fashions Ltd., 1,720 Kgs., Rs. 3,15,855.

REFLEX BLUE: From Germany: United Ink & Varnish Co. Ltd., 500 Kgs., Rs. 1,63,382.

RESOLIN BLUE: From Germany: General Exports Enterprises, 350 Kgs., Rs. 3,84,952.

RESOLIN RED F 3BS: From Germany: Ashok Fashion Pvt. Ltd., 150 Kgs., Rs. 1,66,486; From Germany: Geebee Trading Co., 780 Kgs., Rs. 7,73,566; The Jamshri Ranjitsinghji Spg. & Wvg. Mills Co. Ltd., 450 Kgs., Rs. 4,98,137; 510 Kgs., Rs. 5,71,997; 510 Kgs., Rs. 5,21,145.

RESOLIN RED: From Germany: Modern Emporium, 150 Kgs., Rs. 1,66,046.

SULPHUR BLUE: From China: Noble House, 3,900 Kgs., Rs. 2,76,826.

SULPHUR LIGHT YELLOW: From China: Kumar Carpet Export, 2,000 Kgs., Rs. 1,12,387; Shekh Bhulan & Sons, 3,000 Kgs., Rs. 1,68,580.

SYNOLON TURQUOISE: From Korea: Anishkumar & Co., 1,000 Kgs., Rs. 7,62,264.

TINOPAL CBS-X: From Switzerland: Godrej Soaps Ltd., 2.800 Mts., Rs. 23,93,950.

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Wind farms in Western Countries

THE modern wind power industry was born in Denmark while Holland can lay claim to be the originator of the idea. The Danish Government is committed to the utilisation of energy from perennial and renewable sources to meet the domestic power needs.

Founded in 1983, Micon has made its mark as one of the world's leading manufacturers of the wind powered generators. When the company celebrated its fifth birthday, 1,600 wind turbines had left Micon's factories.

Micon was the first Danish wind energy company to produce wind turbines with rated capacities of 108 kW and 250 kW. Micro-processor control instruments, which replaced the relay control systems of earlier days, were introduced to the market by Micon along with the easy-to-service modular construction principle.

As part of its energy policy, Denmark has decided that as broad a section of the population as possible must be actively employed in the use of renewable forms of energy. This has meant that "wind turbine cooperatives", set up privately by groups of individuals, are treated kindly by the tax laws. Such a cooperative typically comprises a number of families which have come together with the express purpose of buying a wind turbine. A site with good winds is found in their area and the wind turbine of their choice is erected and connected to the electrical grid. All of the wind turbines production is sold to the electric utility at a previously arranged rate.

The individual families are allowed to invest in the wind turbine in proportion to the amount of electrcity they use and profits from the installation are shared in the same way. The wind turbines are financed by a variety of combinations of cash payments, bank loans and mortgages.

Holland is saturated in windmill history but even recently Danish wind energy technology has been in demand. In 1989, Micon delivered six Micon 250 Kw wind turbines to a private industrial business in Vissingen. The wind turbines are located close to the factory which uses large amounts of energy in its wood drying kilns. Again the wind turbines met all projected kWh estimates. Proving so successfull an investment the owner expanded the project with additional turbines. It is calculated the wind turbines will produce 5.5 million kWh a year.

With the advent of the Californian market, Denmark's wind industry expanded rapidly in the mid-1980's. An energy policy aimed at protection of the environment, together with an extremely favorable investment climate, soon made California a wind turbine Mecca.

Today, there are thousands of turbines producing power, a considerable number of which are Micon's. The majority of wind turbines in the U.S. are concentrated in wind power plants. In this way savings are made on cable connections as well as development of roads and transformer stations. Experienced staff are employed to operate a wind power plant and their job is to make sure the wind turbines are always available to produce power, and properly maintained. Each wind power plant transmits directly into the utility grid.

In California's Altamont Pass the climate is similar to that found in Northern Europe. Although the wind is similar, the temperature is considerably warmer. The majority of wind power plants are installed by companies owned by a variety of investors in Denmark or America.

The largest wind power plant of Micon wind turbines in the Southern Californian Tehachapi Mountains consistst of 140 Micon 108 kW turbines. It was installed in 1987 by Cannon Energy Corporation. Here the climate is extremely harsh on the wind turbines. The Micon wind plant is sited along an undulating mountain ridge which suffers extremely turbulent winds reaching speeds up to 160 km/h. The temperature varies from minus 15 degrees Celsius to plus 35 degrees Celsius.

The electricity produced by the wind power plant is sold to Southern California Edison under the terms of a long term commercial contract. The wind turbines have fully operated up to expectations. The best sited wind turbines each having annually produced 400,000 kW/h of electricity.

In 1988, the same wind power plant developer installed the first Micon 250 kW wind turbine ever in the United States. This wind turbine produces around 750,000 kW/h a year. Its successful operation paved the way for a major project development of Micon 250 kW machines the following year.

Palm Springs California, offers some of the most extreme climatic conditions in which a wind turbine has to operate. The desert temperature rises to 50 degrees Celsius during the day dropping to minus 5 degrees Celsius at night. Wind speeds are at up to 160 km/h, but already by approx. 30 km/h sand storm sets in and by approx. 40 km/h hubheight sand storms are whipped up, demanding extremely robust machines. Micon has delivered over 1,000 wind turbines for installation in this area.

The British Scene

In Britain, when wind power takes off, it will be the preserve of large companies like Taylor Woodrow, British Aero-space, Tomen, the Japanese trading house, Seawest, of the US, the world's largest independent wind farm developer, National Power and Power Gen.

Britain currently has just 8 MW of wind power generating capacity installed, compared with 320 MW in Denmark. California, the world leader in wind power, has 1,500 MW of generating capacity. It is believed that regional electricity companies in England and Wales will be told to contract out 58MW-116MW of new generating capacity to wind farm developers.

Wind farm developers have, meanwhile, submitted to them more than 40 competing proposals for wind farms generating at least twice Dutch capacity. Britain is one of the windiest countries in the world — some experts say at least a fifth of its electricity could be generated by wind. Yet the Government's target for 2000 is to obtain just 2 per cent of the country's electricity requirements from all renewable energy sources, including wind, wave, hydro, geothermal and landfill gases.

Wind power enthusiasts say this is not enough. Denmark's target for the end of the decade is to produce 10 per cent of its electricity from wind alone. The Netherlands has a goal of 1,000MW of installed capacit the end of the century. Germany, Spain, India and E all have more ambitious wind energy targets than UK, according to Greenpeace, the environmental gr

Wind power appeared on the political agenda in tain only three and half years ago. The industry is a behest of the Government's Non Fossil Fuel Obliga which requires the regional electricity companie secure access to a specified amount of renew energy.

The first Renewable Order under the NFFO was m in September last year, requiring an installed capa of 30MW for wind power. The NFFO promises a ma and a premium price of renewable energy until 19 based on the lowest prices in the wind farm tende

Ciritics are unhappy with many parts of the ren ables policy, attacking its short-term nature and lim application. Renewable energy, like nuclear pow requires subsidies in its early years to make it econ ically viable for developers.

The Government's annual price subsidy for ren ables is just 40p per household compared with 17 nuclear power. Another problem for potential devel ers is that only England and Wales are covered by premium price guarantee and the obligation on elect ity companies to take renewable energy.

The best source of Britain's wind power is in Scotla but both it and Northern Ireland are excluded from G ernment legislation. There is also the absence of coherent set of planning guidelines for wind farms in t UK. Conservationists are increasingly unhappy ab the possibility of wind turbines marring the natural bea of the countryside and are stepping up objections planning applications.

If Britain is committed to renewable sources of energ it could learn much from California. The state has ge erated part of its electricity supply from wind power sin 1981, producing 79 per cent of last year's total wor wide wind energy generated of 3.2 bn kWh.

More than 15,000 wind turbines together satisfy 1 p cent of the state's energy demand. The energy sour is so well established that wind is not only one of t least costly sources of renewable energy, it is almo as cheap to produce as coal and nuclear power.

The California Energy Commission said a new wi plant can generate electricity at a cost of 4.7-7.

cents/kWh, compared with about 6-7 cent/kWh for a new natural gas plant and 4.9-7.25 cents/kWh from existing conventional power plants. In the early days wind power cost about 50 cents/kWh. California's success is a product of the state's commitment to the industry, involving long term contracts for wind farm developers and generous tax incentives for investors. Utilities were required to offer wind farm developers 30 year contracts guaranteeing especially high prices for their electricity in the first 10 years, when capital cost repayments would be highest.

Denmark, the world's second largest producer, also owes its wind power succeses to a Government commitment to support the industry, both politically and financially. The Government forced utilities to develop large wind farms while local communities were encouraged to buy their own windmills to satisfy local electricity needs. Danish wind power now costs about one-third its original price.

The benefits of wind power are proven. It is environmentally sound, with a single wind turbine able to save emissions of more than 1,000 tonnes of carbon dioxide every year. The fuel is free — if not always reliable in the short-term. The technology in wind turbines is advanced, with reduced noise levels and improved efficiency. And prices for wind power can, over time, compete on the open market.

For more than 12 years, the Energy Research Unit (ERU) at the Rutherford Appleton Laboratory (RAL) near Oxford has conducted research programmes into the study of wind energy and its possible exploitation for commercial use. Headed by Professor Norman Lipman, the unit operates a university wind research site at the RAL on behalf of the Science & Engineering Research Council (SERC), and provides on-the-spot support to 12 university research teams.

The ERU has built up expertise in areas, including the measurement of wind energy and the identification of potentially useful sites in Britain; structural studies of wind turbine machine: the development of computer models to evaluate the extent to which wind power plant could be integrated into large-, medium- or small-sized power distribution networks; and the development of electromechanical systems.

A good example of a wind integration study programme involved collaboration with Reading University, west of London, and looked into the possibility of integrating a large wind energy electrical generating system into Britain's national grid. The study demonstrated the possibility of the grid accommodating, if required to do so, up to 30 per cent of Britain's annual electrical generation by way of wind power. ERU researchers also studied the possible integration of wind energy systems into small-scale autonomous generating systems, such as those comprising one or two diesel-electric sets with a combined generating capacity in the region of 10 kW to 200 kW of diesel power.

Small-scale generating systems are of considerable interest to wind researchers. They present, for example, a high technical challenge, since with only one or two generating sets and one or two wind turbines, the options available for mixing and matching generating capacity to satisfy demand are severely limited.

On the other hand, they offer a much better chance of establishing a working demonstration system than would be the case for a large-scale system suitable for connection to the national grid. At first glance there appear to be few problems associated with the design, construction and operation of a combined wind-turbine/diesel generating system. After all, when the wind is not blowing strongly enough, the diesel engine can be switched on and continue to generate the electrical energy previously supplied by the wind turbine.

When the wind does blow strongly enough, the wind turbine can be arranged to reduce the load placed on the diesel engine, allowing it to work less hard and, in doing so, save valuable fuel.

Unfortunately, diesel engines refuse to cooperate in such a straight-forward manner. Many diesel engines are designed to operate at maximum efficiency at loads well in excess of 40 per cent full-load rating. Such engines, when operated at loads less than this, suffer a significant reduction in efficiency. A typical diesel generator set operated at no-load (tick-over), consumes almost 30 per cent of the fuel it consumes when operated at full power. There seems little point, therefore, in varying the load on the diesel engine in an integrated wind turbine/diesel generating system to accommodate variations in wind speed.

Scientists at the ERU, faced with this problem, have come to the conclusion that the most effective way of operating a wind-turbine/diesel system is to adopt an operating regime that involves a complete shut-down of the diesel engine on a regular basis, depending on the prevailing conditions.

But what happens when the diesel is shut down and the wind suddenly drops? Obviously, some form of

energy storage is required to keep the electrical generator turning during the time taken to re-start the diesel and bring it up to full power. This itself introduces another problem in that fequent start-ups are wasteful of fuel and increase engine wear. A much better approach is to ignore the need for frequent diesel start-ups and instead introduce some form of energy storage which has sufficient capacity to bridge the gap between short-term reductions in wind speed.

In this way the diesel would only be started up when the fall in wind speed was sustained. The all important question is, of course, just what level of energy is required to be stored, for how long and how often? The most obvious source of energy storage is an electrical battery. This is a tried and tested device of high reliability and a well-understood technology.

Its disadvantages are that it has a finite charge/discharge cycle lifetime and expensive inverters are required to convert the direct current (dc) potential of the battery system into the alternating current (ac) potential of the wind-turbine/diesel-driven generator. Wind energy researchers at the ERU, in considering the problems associated with energy storage systems, have recently begun experimenting with a flywheel to store the energy required for periods lasting a few tens of seconds. They have coupled a flywheel to the 6.5 kW ERU experimental wind-turbine/diesel generating system at the RAL site.

The system comprises a 16 kW wind turbine, a diesel/flywheel assembly, experimental loads, plus control and monitoring equipment. It was developed as part of a project that involved collaboration between the ERU, the Power Engineering Group at Imperial College, London, Hawker Siddeley Power Plant, and John Laing PLC. In the experimental set-up, a toothed belt is used to couple the flywheel directly to the synchronous generator. Although direct coupling makes the system simple and rugged, it does mean that when energy is absorbed from the flywheel, the output frequency of the generator must fall somewhat. However, provided the output voltage produced by the generator is kept fairly steady then frequency variations in the region of $\pm$ 10% are, in most cases, acceptable, especially by the small power user.

INSTALLATION OF WIND TURBO GENERATOR BASED ON DANISH KNOW-HOW (Vestas)

Country	No. of WTGs	Capacity kW
Denmark	1,029	133,475
Norway	8	2,830
Sweden	33	6,515
Germany	83	15,480
Greece	40	8,340
Italy	1	400
United Kingdom	19	5,425
Turkey	1	55
Cape Verde	3	165
Israel	3	455
China	5	275
India	113	15,295
North Korea	2	180
Spain	28	5,310
France	1	200
Finland	1	225
Montserrat	2	200
U.S.A.	2,607	287,460
Total	**3,979**	**481,985**

— T.P.S. RAJA

CHEMARENA

S.L. VENKITESWARAN

Asia Pacific petroleum demand

Demand of petroleum products has remained strong in the Asia Pacific region and has now reached 13.4 million BPD after a 7% rise in 1991. The overall world demand was flat in 1991 and the Asia Pacific demand has overtaken W. Europe to become the world's second largest consuming region after U.S.A.

The growth of diesel fuel was 7% while that of naphtha was 9% due to the big rise in petrochemical conversion. Excluding Japan the growth was 7.2% with South Korea topping with 21% and Thailand by 10%. India has had to restrict growth in view of the need to import nearly half of the requirements and efforts are to place indirect curbs on demand growth.

The forecast for AD 2000 for this region is that demand will reach 16 MM bpd in 1995 and 18.6 by turn of the century — an average 4% growth rate. Diesel will continue to rise at 5-5.5% average and naphtha at 5%. The crude oil production in 1990 in the region was 6.5 MM bpd with China, Indonesia, Malaysia and India being substantial producers. By 2000 AD China and Indonesia will be net oil importers and imports into the region will go up with repercussions on the Middle East oil supplies and prices. India can face very serious problems as previously planned new oil production is far less than the demand/supply gap. For the region as a whole import dependence will rise to 54% from the present 48% —not a happy prospect to contemplate.

World fibres output in 1991

World production of man-made fibres (synthetics and cellulosics) rose slightly last year to touch 19.3 million tonnes. Synthetics were 84% at 16.2 million tonnes and cellulosics dropped to 16% at 3.2 million tonnes. What is of interest is that over half is man-made fibres with the rest being natural fibres. Developing countries make up over half (54%) with US 19%, Western Europe 18% and Japan 9%. South East Asia is the centre of rapid growth with Korea and Taiwan as leaders and the growth has been 500% in the last 20 years.

The exports from these countries have led to decline in production of US and West Europe. Imports into West Europe is said to have reached 2.7 million tonnes, most of it from South Asia.

Of the synthetics, polyamides was down while acrylics increased slightly in the West. Polyester continues to rise both in the west and rest of the world and accounted for 54% of total as against polyamides 23% and acrylics 15%. Other synthetics such as polypropylene and special fibres were 1.54 million tonnes. In tyrecord there is still a place for rayon and polyester gives a close fight with polyamides and glass with no fibre being dominant. South Korea is reportedly the largest producer of polyester. India has to catch up from the present fourth or fifth position in the Pacific Area but India's large share of cotton is a factor for slower share of all synthetic fibres. There is need to step up the production of fibre intermediates — in which India is not yet happily placed.

Limits to Growth

The publication of "Limits to Growth" 20 years ago set the world thinking of the resources position and the impacts of ever increasing growth such as more pollution and environmental damage. The logical conclusion of the Report was that steps have to be taken urgently for setting limits to growth and use of fossil energy sources and other resources before the world reached a point of no return from the inevitable disaster. In the last two decades there has been much thinking on ways to tackle pollution of air and water and strict regulations on the emissions from automobiles, increased efficiency in the use of energy in factories, homes and particularly in transport vehicles. Other serious hazards such as the "ozone" hole — depletion of this protective layer of the stratosphere threatened by emissions of chlorofluorocarbons — an index of civilisation — and the more

dangerous rise in global temperature as a consequence of the rise in carbon dioxide levels (from fossil fuels-mostly). Steps to tackle this problem and move towards a "climate treaty" are being discussed at an "Earth Summit" of nearly a hundred nations in Brazil.

The "Limits to Growth" has been revised twice or thrice on the basis of more accurate data and efforts to curb consumption. Now the latest version is "Beyond the Limits" — A study that advocates boldly the concept of enough — enough of growth to achieve a sustainable society but no more. Unless present consumption of materials and energy, population growth and pollution are scaled back and fairly quickly the consequences for world economy will be inevitable disaster within a few decades. We are now consuming resources and producing wastes at rates we can no longer sustain and physical limits are being overshot in spite of improved technology — a fact that seems to be clear even without any computer models or system dynamics.

To prevent this headlong plunge into ecological disaster the study recommends:

1. using such non-renewable resources such as fossil fuels, ground waters, minerals at minimal rates,
2. using living renewable resources only at rates at which they can regenerate themselves,
3. using all resources at maximum efficiency,
4. halting the exponential growth of population and industrial output by adopting the concept of "enough" rather than "more", and sustainable levels.
5. developing approaches to end poverty based on concepts of "sufficiency" and "solidarity",

— a return to Gandhian economics?

But the business community is not impressed. The US Council of International Business claims that there are changes all the time to counter the adverse factors. But the latest study focusses on choices and opportunities though the views on the choices may differ. The authors of "Beyond the Limits" call for "equity, sufficiency, efficiency" and "love, generosity and compromise" — the last may sound strange in the present global setting. Whatever be the actions and reactions on limits to growth beyond sustainable levels the "population bomb" needs to be tackled immediately.

A counter study on "changing courses" argues that the Business Community is convinced that "economic incentives" will work better and "competitive free markets" are needed to develop alternate technologies towards "ecoefficiency". But the physical limits to Earth's resources and "sinks" are recognised even if solutions suggested may be difficult. If significant cuts in materials and energy flows are not made there will be uncontrolled decline in per capita food output, energy use, and industrial production in the coming decades. This decline can be avoided by revision of policies and practices that perpetuate growth in consumption, population and a dramatic rise in efficiencies in the use of energy and materials. Sustainable society is still feasible if emphasis is on equity (between nations and the developed and developing world), quality of life rather than on quantity of output and requires materials, compassion, wisdom, more productivity and technology.

India's planners must take a look into the future beyond the early 20th century and the fall out of present policies.

(Ref. *C.E. News*, 27/4/1992)

Hydrogen Peroxide plant explosion

Oxy-synthese's hydrogen peroxide plant in France suffered an explosion on 22nd April. This is a joint venture of Atochemie and L'Air Liquide of 100,000 TPA capacity but only one unit of 50,000 TPA was damaged. The second unit needs check-up before restart. This accident has helped to firm up prices at DM 2.7 per kgm on 100% basis but there is no serious shortage as demand growth has been less than anticipated, particularly in pulp/paper industry. Kemira of Finland and Eka Nobel have started new plants and Degussa is also starting a new 35,000 TPA plant. The reasons for the explosion are not revealed.

Lonza of Switzerland also suffered explosion in the niacin plant at Visp. The cause is reported to be the crystallisation of salts including organic nitrates in a neutralisation tank when the solvent evaporated during a small shut down for rectifying malfunction in a measurement and control equipment. Damage is heavy at over $ 3 million.

FRANKLY SPEAKING: by Dr. O.P. KHARBANDA

The Wall Street Journal on Managing

This title (Ed: David Asman, 256p, 1990, Doubleday/-Currency) carries the explanatory subtitle: Adding value through synergy. And what exactly is synergy? The jacket flap tells us that it is the art of making 1+1=3 and it is the lesson to be learned from the new winners in business. Synergy has been the hallmark of success. By combining seemingly incompatible elements new ways can be found to solve old problems, and in the process squeeze out more bang out of fewer bucks. The world of synergies in business is not as complicated as it might seem, but managers must be aware of these to tackle the tough times ahead. The road of 80's covered so successfully had as many potential hazards as the road ahead. Synergy is the great new hope for the 90's. The book is a collection from one of the most popular column, Managers Journal of WSJ (DA has been its editor since 1983). Through carefully documented case studies usually told by the participants themselves, present collection brings together selections from this column of WSJ over the turbulent period (1984-89). Editors and authors have added new examples and developments to make the pieces timely. Throughout the emphasis is on practical advice, with something for everyone. These stories show how to build bridges between departments, people, and products to get an effect greater than their sum. A total of 73 articles are included and classified under four broad headings, demonstrating synergies:

* Within your market place (18)
* With your employees (19)
* With the economic environment (15)
* In the world market (21)

Eighties was an era of expansion, also a decade fraught with fear (of takeovers, deficit, foreign competition, 'rusting' industrial sector, 'hollow corporation' etc.) and despite the dire warnings, we pulled through far better than expected. The common link to the successful strategies of the 80's was: synergy, managers discovering new ways to solve old problems — with courage. Rather than fighting those things that scared them, successful managers found ways to work with the very objects of their fears to create a superior product or service.

Dr. Kharbanda, is a visiting professor and an author of repute. His recent title: COMPANY CULTURE: IT'S ROLE IN AN INDUSTRIAL SOCIETY (IMDS 1991). Available from Vivek Enterprises, 5 S.K. Barodawalla Marg, Bombay - 400 026.

Synergy within your market place: Developin[g] proper synergy between your product, customers a[nd] competitors can result in a turnaround even in the m[ost] hopeless case, e.g., in smokestack industries desp[ite] the most dire predictions of analysts. Synergy has [led] to higher productivity and survival. The razzle-dazzle [of] the service sector at the expense of industrial mus[cle] has turned out to be totally misplaced. The amazing tu[rn]around in smokestack industries has posed a very re[le]vant question: Can services learn from manufacturin[g]

Synergy with your employees: This is particula[rly] difficult in the current context of downsizing, freque[nt] turnovers, lure of foreign labour and the ever increa[s]ing cost of labour benefits. Answer lies in synergy [at] work, e.g.:

* Decline of union membership has simplified negot[ia]tions
* Joint labor-management defense against takeove[rs] through stock ownership plans
* Workers enthusiasm and retraining for upgradi[ng] manufacturing
* Greater flexibility employer — employee relations rul[es]

Synergy with the economic environment: [No] matter how efficient your operations, you can't cont[rol] the overall market, unless you can read the market a[nd] act appropriately. Successful managers don't fight h[is]tory, they make history by formulating inventive stra[t]egies to survive a down market and exploit an up mark[et] by finding a synergy with the market. Amidst t[he] mergers-and-acquisitions frenzy of the 80's, there a[re] roles for managers to play — if only to guard again[st] their own futures.

Synergy in the world market: A good competitor [is] not always a bad competitor, at home or abroad. Unde[r]cutting a local competitor to gain market share is co[n]sidered a smart thing, but when resorted to by a forei[gn] competitor, it is hailed as dumping. Money spent on lo[b]byists and lawyers would be far better spent investi[ng] in synergistic fits with foreign competitors. Protection [is] no answer. This chapter seeks to demythologize Ja[p]anese managers by showing their weaknesses, al[so] similarities to managers elsewhere. You must ge[t to] know your competitors before you can work with the[m] and, if need be, outmanage them. An excellent colle[c]tion, very relevant, and a must reading.

Oswal Agro planning Rs. 600 crore expansion

Oswal Agro Mills Limited has planned a massive expansion plan worth more than Rs. 600 crore in the next two years. The company has already taken up implementation of sugar-cum-chemicals complexes in the sugarcane-rich Uttar Pradesh. It has completed the erection of a 2,500 tcd sugar mill at Dhanaura in Uttar Pradesh with a total capital expenditure of more than Rs. 40 crore, which has since gone into commercial production.

The capacity of this mill is now being enhanced to 12,000 tcd with down-stream units of alcohol, LDPE and furfural with captive power generation. This complex is expected to go into commercial production by early 1993. The company has also planned another sugar-cum-chemical complex at Shajahanpur. The total cost for these two projects are expected to be in the region of Rs. 600 crore in the next two years, and after completion, they are expected to raise the company's turnover to over Rs. 1,100 crore by 1995. The company has already placed orders for the major long delivery equipment.

Oswal Agro has also been successful in its bid to set up a 600 MW power project at Shajahanpur in UP. The total capital cost for this project is likely to be in the region of Rs. 1,800 crore. The company is currently in the process of tying up for the availability of gas with the Gas Authority of India. The project is scheduled to begin commercial production in 1996.

For the 18 months ended December 31, 1991, the company has registered a turnover of Rs. 413.38 crore against the Rs. 301.50 crore for the 12 months ended June 30, 1990. The profit for the period before depreciation and tax was Rs. 58.90 crore, and after tax and depreciation Rs. 30.49 crore.

The Board of Directors of the company which met recently has decided to declare a dividend of 21 per cent for this period against 50 per cent last year. According to a company release, the dividend has been kept at a low level to part-finance the expansion.

The company had infact a low level of operations in Ludhiana which led to a drastic fall in the profits. The net profit of the Ludhiana unit has gone down to Rs. 14 crore from Rs. 36 crore in the previous period. The activities of the Ludhiana unit suffered a set back due to the reduced export to Soviet Union where the company was the largest exporter of soaps from the country.

However, the petrochemicals operations of the company during this time had done well. The turnover of its units at Chembur near Bombay increased from Rs. 34 crore in the previous period to Rs. 164 crore during the current period.

THREE LECTURES ARRANGED BY UDCT ALUMNI ASSOCIATION

Dr. K. Kalyan, Chairman of Elder Pharmaceuticals Ltd., will give a talk to the members of the UDCT Alumni Association on 19th June, 1992 at 6.00 p.m. at Old Auditorium, UDCT, Matunga, on **"Role of Chemical Engineers in the Pharmaceutical Industry".**

Dr. K. Kalyan, holds a doctorate degree in Pharmacy from the University of London and Fellowships of Royal Society of Health and Royal Institute of Chemistry, London, with proven record of success both in technical and commercial fields. He is having more than three decades of work experience in Pharmaceuticals Industry. He worked with Boots India as Managing Director, earlier to present position.

Mr. V.D. Sanghavi, Managing Director of Aarvi Encon Pvt. Ltd., —Chemical Project Consultants will deliver the second lecture titled **"Careers for Chemical Engineer"** on 28th August, 1992.

Mr. Sanghavi, is a Chemical Engineer from University of Bombay with more than twenty seven years of Industrial experience. He has been involved in offering consultancy services to various reputed companies like M/s. Herdillia Chemicals Ltd., M/s. Hardcastle & Waud Mfg. Co. Ltd., M/s. Deepak Nitrite Ltd., M/s. Schenectady Chemicals (I) Pvt. Ltd., M/s. Jaysynth Dyechem Pvt. Ltd., M/s. Bombay Mineral Supply Co. Pvt. Ltd., M/s. U.S. Vitamin (I) Ltd.

Before starting M/s. Aarvi Encon Pvt. Ltd., he had practical experience in number of firms like M/s. Merck Sharp & Dohme India Ltd., M/s. Lubrizol India Ltd., M/s. Davy Powergas India Pvt. Ltd., M/s. Bhansali Engineering Polymers Ltd., as 'Vice President —Projects'.

Dr. T.V.K. Satyanarayana of S.V.S. Consultants, Vashi, New Bombay will also give a lecture on **"Chemical Industry and Capital Markets"**, on 25th September, 1992.

Dr. Satyanarayana is a Chemical Engineer with Master Degree in Business Administration. He was associated with Tata Economic Consultancy Services during the year 1974-1988. He also acted as a Project Co-ordinator on various assignments such as market surveys, technoeconomic feasibility studies, revaluation studies for diverse products in different industries.

He started his own consultancy firm — SVS Consultants at New Bombay. He is a consultant on portfolio management programmes. He deals with both primary and secondary market operations of capital market in India.

Castor oil prices likely to rule firm

Castor oil price has been rising teadily for some time past in the local narkets, with the tanker and drum load il moving up to Rs. 1,800/1,850 per uintal from Rs. 1,750/1,780 according o the *National News Service.*

Quoting market sources, it attributes he increase in prices to the expectations f export enquiries, adulteration with mustard and other edible oils and the decline in production by two lakh onnes to around 5.50 lakh tonnes during 1991-92. Sources point out that new castor crop commences from October, and despite decline in production by about two lakh tonnes last year, prices showed a fluctuation of Rs. 200 per quintal because exports to Russia and East European countries declined considerably and industrial consumption of the oil was also lower.

Castor production during 1990-91 had slid down to 5.20 lakh tonnes from 7.5 lakh tonnes in the previous year. However, due to meagre export enquiries, prices of castor oil in the corresponding period last year ruled at Rs. 1,250/1,280 a quintal, showing a sharp spurt of Rs. 500 a quintal over the year ago levels. This sharp upsurge was due to zooming industrial as well as export demand. And yet the decline in output did not cause concern as sufficient carry-over stock was available. In April this year, the surplus stock of castor in Gujarat was reported about 25 lakh bags sufficient to yield about 83,000 tonnes of castor oil.

Apart from this, about 10,000 tonnes of castor oil were reportedly lying with the co-operatives. Besides, Andhra Pradesh, Karnataka and Maharashtra accounted for 10 lakh bags of castor equivalent to 30,000 tonnes. Thus, the total stock of castor oil was about 1.13 lakh tonnes. Industrial demand for castor oil is estimated at one lakh tonnes a year and exports at about 35,000 tonnes. Till the inflow of new crop, which is expected after six months, industrial consumption is likely to be around 50,000 tonnes. Including export of about 35,000 tonnes, total demand would be around 85,000 tonnes of castor oil while the stock last month was 2.26 lakh tonnes.

For the last few years, clandestine mixing of castor oil with other edible oils has been going on. On a rough estimate about one lakh tonnes of castor oil is mixed with other edible oils annually. Sources point out that maximum adulteration of castor oil takes place in edible oils supplied to the Vanaspati industry because, after processing, the harmful effects of adulteration are not easily traceable. Mixing of castor oil in ground oil is reported from almost all the states. Traders are also believed to be mixing a small quantity of castor oil in other refined edible oils. Following higher prices of oilseeds, the profit margin of millers for producing mustard, soyabean and cottonseed oils has declined. Vanaspati units also have been adulterating mustard oil in vanaspati production and procuring this oil without bills. In such deals it is easy to cover up consumption of castor oil. Nevertheless, the export outlook remains bright with practically no competition.

GOODWILL OIL SETTING UP 100 PER CENT EOU

Goodwill Oil & Chemical Ltd., is setting up a 100% export oriented unit for manufacturing medicinal castor oil. The plant is located at Goparasa Nallur on the Madras-Bangalore Highway. The company has developed its own process for the manufacture of medicinal castor oil, conforming to BP/USP specifications and No. 1 oil as per American Standard of Testing Material specifications. It will be the first Indian company to have successfully conducted trials to obtain castor oil that meets international specifications.

Oleoresins export to US may be affected

The recent United States decision to invoke certain provisions of 'Super 301' may hit exports of oleoresin. The United States accounts for nearly 60 per cent of India's annual exports of 1,200 tonnes of oleoresin.

The value of exports of oleoresins to the US is placed officially at Rs. 25 crores a year. **Mr. T. Nandakumar,** Spices Board Chairman, told newsmen recently that following the invocation of 'Super 301', US importers of the product would have to pay a six per cent import duty.

This would push up the price of Indian oleoresin making the product uncompetitive. The Spices Board, he said, had represented to the Kerala government to waive the five per cent purchase tax on pepper used in the manufacture of oleoresin.

This way, the cost escalation of Indian oleoresin in the US market could be offset, helping the product to remain competitive in the world market, he added.

Mr. Nandakumar said spices exports from India touched a record 1.30 lakh tonnes, valued at Rs. 362 crores, during 1991-92, an increase of 50 per cent in value and 19 per cent in quantity when compared to the previous year. As a result, India's share in the world market for spices, estimated at four lakh tonnes a year, went up to 33 per cent from 22 per cent in the past few years.

This achievement, possible due to vigorous promotion measures by the board, was heartening when it was weighted against the background of the collapse of the erstwhile Soviet Union, India's major trading partner, and the resultant steep drop in pepper exports, he said. Mr. Nandakumar said a logo promotion scheme would soon be launched abroad to give an identity to Indian spices.

An export target of 1.50 lakh tonnes of spices, valued at Rs. 426 crores, had been fixed for 1992-93, he added.

ILIA PLEA FOR UPWARD REVISION OF DRAWBACK RATES

The Indian Leather Industries Association (ILIA) has urged the Centre for an upward revision of duty drawback rates for the leather industry.

Expressing disappointment over the Union Finance Ministry's decision not to enhance the duty drawback rates for leather and leather products during the current year, **Mr. Zameerul Hasan,** President, ILIA, said that it would have a deterrent effect on the export prospects of the industry, especially at a time when import costs have risen substantially.

He said that the leather industry is already facing rough weather due to the disruption of the Soviet market for Indian leather and leather goods. According to Mr. Hasan, while devaluation had already made imports costlier, convertibility of the rupee had made the process cumbersome.

The ILIA President failed to find any logic behind the government's continuing with the previous duty drawback rates for leather, especially when the upward revision on 161 items had already been announced with a view to compensate exporters for the increases in international prices.

Mr. Hasan said, while the prices of finished leather had gone up by around 25 per cent, the Indian leather products industry which is the third largest foreign exchange earner for the country is experiencing a deceleration in terms of growth since 1991-92. The recent government decision to maintain a status quo on the duty drawback rates would also have its spin-off.

INDIAN MEMBRANE SOCIETY — NATIONAL CONFERENCE

The 10th National Conference of the Indian Membrane Society on 'Recent Trends in Membrane Science & Technology' will be held at the Bhabha Atomic Research Centre (BARC), Trombay on January 21-22, 1993.

The conference will have plenary lectures and invited talks from eminent personalities in the membrane field as well as presentation of papers from leading researchers. The broad areas proposed to be covered in the conference are:

(1) Polymer synthesis and membrane characterisation
(2) Membrane applications in nuclear industry
(3) Membrane applications in biotech industries
(4) Membranes in desalination and water & effluent water treatment
(5) New membrane processes & transport through membranes.

Last date for receiving abstracts is 31st August 1992, and for submission of full papers is 30th November 1992.

An exhibition is also planned on the occassion. For this purpose space will be provided for the display of equipments, products and instruments useful for membrane development and membrane technology applications. All interested in exhibiting their range of supplies should contact the convenor before 30th November 1992.

For further details contact: The Convener, 10th IMS National Conference, Desalination Division, Bhabha Atomic Research Centre, Bombay - 400 085.

CFC consumption down 40% from 1986 levels

World-wide consumption of chlorofluorocarbons (CFCs), the main agent responsible for ozone depletion is now 40 per cent below the 1986 levels. At this pace, the consumption of CFCs by the developed countries might be reduced to 50 per cent by the end of this year, according to United Nations Environment Programme (UNEP) Executive Director **Mr. Mostafa K. Tolba.**

Major reduction in the consumption of CFCs had been achieved by using hydrocarbons as aerosol propellants and as blowing agents for flexible foams. Solvent users are turning to aqueous and semi-aqueous systems and other solvents, Dr. Tolba has said in a communication to noted environmentalist **Dr. G.M. Oza.** Refrigeration and air conditioning sectors are recovering and recycling CFC refrigerants and increasing the use of HCFCs. Insulating foams have now a lower CFC content, according to Dr. Tolba.

Reacting to the latest scientific reports of increasing and spreading ozone depletion, 150 experts from 56 countries agreed recently in Geneva on the necessity of advancing the phase-out of CFCs and halons from the year 2,000 to January 1, 1996. Experts — scientific, legal and environmental — had come together for the 10-day-long meeting of the working group of the parties to the Montreal Protocol.

According to Dr. Tolba, a 1996 phase-out of CFCs, halons and other chemicals, controlled by the 1990 London Amendment of the Montreal Protocol, will speed up the recovery of the ozone layer by 10 to 15 years. In terms of human health this could mean a total of about a million fewer cases of skin cancer and about 3,50,000 fewer cases of cataract-induced blindness per year, he said.

However, the scientific assessment report prepared by more than 100 scientists from 28 countries and submitted to the working group, stated that the ozone layer is being depleted at an even faster rate than predicted. This was true at high and mid-latitudes, in both hemispheres, and not only in winter, but in all seasons. Depletion now covers North America, a large part of South America and Asia, nearly the whole of Europe, Australia and New Zealand, while the tropics remain the only unaffected areas. Current estimates predict a 5 to 10 per cent ozone depletion for mid-latitudes in summer by the year 2,000 as compared to the mid-1970s.

If there was a sustained 10 per cent loss of ozone, said Dr. Tolba, one could expect a 26 per cent increase in the incidence of non-melanoma skin cancer. The scientific report shows that in four of the past five years, the ozone hole over the Antarctic was deeper and larger than any other ever observed. All these developments showed higher chlorine concentrations in the Arctic air over eastern Canada and north New England than any previously observed in the Arctic or the Antarctic.

Industrially produced chlorine and bromine are believed to be largely responsible for ozone depletion. In spite of current international regulations, atmospheric levels of chlorine and bromine are expected to increase, causing an ozone decrease in the 1990s comparable to that of the 1980s, the scientists said. Another worry of the scientists is the possible effect of increased ultraviolet-B radiation on aquatic organisms. This could reduce phytoplankton biomas and change the composition and diversity of species, a scientist remarked.

In turn, this may reduce marine food production at the bottom of the food chain and, consequently, the food supply of fish and mammals higher on the food chain. According to Dr. Tolba, every developing country has its own specific problems, but in general, they were already taking effective steps to reduce their consumption of ozone depleting substances significantly.

China has an extensive research programme on refrigeration alternatives while Mexico has announced that, with adequate financing, it will follow the same phase-out schedule as developed countries. Singapore has reported a 60% reduction in CFC use. If the challenge of technology transfer and information exchange is met, it will be possible for developing countries to eliminate all production of controlled substances within five to eight years from the date developed countries do so, rather than take the full 10 years as allowed under the protocol.

GOOD PERFORMANCE BY GRAUER & WEIL

The six monthly (unaudited) financial results of Grauer & Weil (India) Ltd. for the period ended March 31, 1992 indicate an overall improvement. Compared to the same period of six months in the previous year, the sales revenue, at Rs. 22.56 crore, showed an increase of 26.3 per cent over the last year's revenue of Rs. 17.86 crore. The gross profit at Rs. 1.30 crore, showed an increase of 47 per cent compared to the last year's figure of Rs. 83 lakhs according to a press release.

The sales revenue, at Rs. 40.82 crore, showed an increase of 24% compared to the last year's figure of Rs. 32.90 crore. The gross profit has also increased from Rs. 2.15 crore to Rs. 2.88 crore registering an increase of 34%. The net profit showed an increase of 31.75% this year as compared to the previous year and the EPS worked out to Rs. 25 this year on the enhanced profit after giving bonus in the ratio of 1:1 during the last year. It achieved an export turnover of Rs. 124.40 lakhs as against exports of Rs.42.67 lakhs during 1990-91.

Beriwal Chemicals to manufacture zinc oxide

Beriwal Chemicals Ltd., promoted by the ABN group, is setting up a project in Haryana for the manufacture of 7,200 tonnes per annum of various grades of zinc oxide. The project will require an investment of Rs. 5.45 crores in the first phase and is expected to start production by the fourth quarter of 1992. It will require an additional investment of Rs. 2.05 crores in the second phase for production of electrolytic grade zinc metal for its captive consumption, according to chairman **Mr. R.S. Beriwal.**

The ABN group comprises several profit making companies in the fields of finance, foods, and petrochemicals. Mr. **M.K. Vasil,** technical director of the company, claimed that the Beriwal Chemicals' venture would be largest facility for zinc oxide in the country. The company will be using both French process and American process for manufacture of various grades of zinc oxide. It will be using zinc ash residue for production of zinc oxide by American process which will produce good quality of zinc oxide at very low price. The company has also drawn up plans to manufacture electrolytic zinc for its captive consumption, according to a company statement. Mr. Beriwal said the company's product had good export potential due to supply shortfall in the developing and developed countries. The company has projected a sales turnover of Rs. 50 crores in 1992-93 which is slated to touch the Rs. 70-crore mark by 1993-94. The profits are projected at Rs. 3.50 crores in 1992-93.

SAKTHI ZINCOX TO GO ON STREAM BY OCT.

Sakthi Zincox — a 100 per cent export-oriented unit to manufacture 99.98 per cent pure zinc oxide matching world standards is expected to go into commercial production in September/October this year, **Mr. C.N. Viswanathan,** Managing Director said in Bombay on June 8, while explaining the salient features of the project.

The company's project is coming at the Madras Export Processing Zone at a capacity of 15 tonnes per day of zinc oxide. The cost of the project is estimated at Rs. 340 lakh. The funds will be raised by the promoters' equity of Rs. 130 lakh and the public issue of Rs. 190 lakh. The company is likely to go public for raising this part fund either by the end of this month or early next month. The plant and machinery are fully indigenous. Zinc oxide is one of the most important ingredients that go into the production of tyres, tubes, paints, ceramics, paper, chemicals and various pharmaceutical and agricultural products.

IOL winding up LOX division

IOL limited (formerly Indian Oxygen Limited) is gradually winding up its liquid oxygen explosive (LOX) division having manufacturing facility located at Ranchi. The services of those employed in the division are being dispensed with on payment of compensation, with only a handful of people still left at Ranchi.

IOL's LOX business amounted to less than Rs. two crores, the profit being of the order of Rs. five lakh annually. The loss of the business therefore is unlikely to have much impact on a company with an estimated total annual turnover of Rs. 150 crore, according to company sources.

Two factors are believed to have prompted IOL management to wind up the LOX business. First, the size of the market is shrinking as liquid oxygen explosive is no longer considered safe for handling.

The use of the explosive therefore is being gradually discontinued in collieries. Also, Ranchi being the centre of Jharkhand movement is politically disturbed.

It might be recalled that IOL sold its welding business to Esab India Limited a couple of years ago and closed down its Kanpur unit last year. The company also proposes to withdraw gradually from Nagpur-based Maharashtra Weldaids Limited, floated jointly with SICOM to produce welding equipment. IOL holds 25 per cent stake in the Nagpur-based company.

The earlier plan to float a new company jointly with BOC for undertaking health care business in a big way has been shelved, sources add. However, IOL has secured all India franchise from Puritan Bennet of the United States for marketing respirators manufactured by the American company. The product will hit the Indian market within the next few months. With this, IOL will gradually discontinue marketing of CPU 1 variety of respirators produced by another American company, Ohmeda, belonging to the BOC Group.

The present size of the country's respirator market is estimated at Rs. 10 crores which, IOL estimates, will witness 50 per cent jump in next two to three years. Hamilton of USA, Siemens and Bayer, both of Germany, are other suppliers of respirators to the Indian market.

The IOL management is very hopeful of the prospect of health care business and estimates 22 to 25 per cent growth annually. In 1991-92, the company's health care business amounted to Rs. 31 crores or so, of which the equipment accounted for nearly Rs. 15 crores, and gas another Rs. 16 crores.

GUJARAT BOROSIL TO SET UP 65 CRORES UNIT

Gujarat Borosil Ltd., promoted by Borosil Glass Works, is setting up a Rs. 64.87-crores project for manufacturing sheet glass in Bharuch district of Gujarat. The plant will have an annual installed capacity of 10 million sq meters of sheet glass (2 mm thickness).

Briefing reporters at Bombay, Chairman **Mr. B.L. Kheruka** said the company's furnace would be the single largest sheet glass furnace in the country (equipped with 6 Pittsburg machines) and consume 25 per cent less fuel compared to any other sheet glass manufacturer in the country.

Gujarat Borosil will have the advantage of the nation-wide marketing network of Window Glass Ltd. (WGL), another company of the group.

WGL manufactures nearly 4 msm of figured and wired glass per annum. Since usage of sheet glass is at least 3 times that of figured and wired glass being procured from WGL, Gujar[at] Borosil will, therefore, be able to mark[et] its entire production to the existin[g] dealer network itself.

The Rs. 64.87 crores project is bein[g] financed by term loans from financi[al] institutions aggregating Rs. 38.9[.] crores, subsidy from Gujarat gover[n]ment of Rs. 25 lakh and equity shar[e] capital of Rs. 25.7 crores.

Out of the equity share capita[l] promoters and directors are contribu[t]ing Rs. 14.6 crores and the balance o[f] Rs. 11.1 crores is being offered to th[e] public.

Out of this, equity shares aggregatin[g] Rs. 1.1 crores are reserved for prefer[r]ential allotment to the shareholders o[f] Borosil Glass Works Ltd. and Windo[w] Glass, and equity shares aggregatin[g] Rs. 55.5 lakh are reserved for prefer[r]ential allotment to the employees of th[e] company. The balance of Rs. 9.4 crores will be offered to the public.

The company has received the CC[.] consent to enter the capital market i[n] July/August.

PINKY CHEMICALS

Pinky Chemicals Ltd., incorporate[d] in 1986 is setting up a project at Chi[p]lun, in Maharashtra for manufacture o[f] pharmaceutical intermediaries, ester[s] and ethers, rubber based adhesives an[d] processing of industrial solvents.

The company has already obtained [a] letter of assurance from the Governmen[t] of Maharashtra for industrial alcoh[ol] which is its major raw material.

The total cost of the project is est[i]mated at Rs. 3.6 crores. The project wi[ll] be financed by promoters equity [of] Rs. 1.24 crores, public issue of Rs. 1.8[.] crores and loans of Rs. 50 lakhs. The company plans to enter the capital market shortly.

NOCIL improves sales; dividend maintained at 40%

National Organic Chemical Indus-ies Ltd. (NOCIL) has repeated the ividend at 40%, including 24% final or the year ended March 31, 1992. The ompany has produced better results. The gross profit is up to Rs. 80.66 rores from Rs. 74.44 crores following rise in the total sales to Rs. 603 crores rom Rs. 498 crores in the previous ear. With depreciation demanding Rs. 14.17 crores against Rs. 14.19 rores, the pre-tax profit is worked out o Rs. 66.49 crores against Rs. 60.25 rores.

The net profit has, however, dropped o Rs. 32.14 crores from Rs. 35.75 crores because taxation has taken much more at Rs. 34.35 crores against Rs. 24.50 crores. The surplus is, on the other hand, far better at Rs. 107.10 crores against Rs. 97.35 lakh owing to the previous year's balance profit of Rs. 74.96 crores against Rs. 61.60 crores. The dividend outgo remains unchanged at Rs. 14.40 crores, including the final payment of Rs. 8.64 crores. It has allocated to the debenture redemption reserve Rs. 2.99 crores against the same and to the general reserve Rs. five crores against the same. The balance Rs. 84.71 crores against Rs. 74.96 crores is to be carried forward.

NOCIL explains that the higher tax provision is on account of increase in tax rates and changes in tax concessions relating to exports. The increase in sales is due to increased selling prices of petrochemicals consequent on hike in the prices of naphtha and other petroleum products in July 1991 and January 1992. As for agrochemicals the turnover has crossed the Rs. 100 crores mark due to increased volumes and better realisations. During the year the company has attained the status of a trading house based on its exports performance. Exports for the year stood at Rs. 60 crores. During the year, NOCIL achieved six million man-hours free of disabling injury for own and contractor employees at Thane. This accomplishment was internationally recognised when the company was awarded the coveted "Sword of Honour" by the British Safety Council for being one of the top 30 safest companies in the world.

KERALA CHEMICALS AND PROTEINS

The directors of Kerala Chemicals and Proteins have proposed to issue bonus shares in the ratio of one for two. Besides, the directors have also decided to recommend a dividend of 50 per cent for the year ended March 1992. During the year, the company has earned a gross profit of Rs. 5.80 crores. After making provision for depreciation of Rs. 27.38 lakh and taxation of Rs. 26.57 lakh, there remained a net profit of Rs. 5.26 crores.

Power tariff may be hiked by 12-15 per cent

The Central Government is expected to unilaterally notify an increase of 12 to 15 per cent in central sector electricity tariff. The new rates will be applied for power generated by all individual central power stations, particularly in the thermal sector.

The Central move has already come in for flak from the state governments, with some of them expressing reservations over the manner in which the rates are being calculated. The Centre, however, is likely to take the state's reservations into account while ordering an increase.

This would be the first time that the Centre will notify electricity rates through an official fiat. Earlier, the convention was for an individual power unit to enter into tariff agreements with the beneficiary states. But the state representatives have been successfully stalling tariff increases on some ground or other, despite the fact that the cost of generation has gone up substantially over the years. In order to get over the road blocks, the Central Government decided to amend the Indian Electricity Supply Act empowering itself with the right to unilaterally announce an increase in tariff rates.

The Central Electricity Authority (CEA) is now working out the details of an exhaustive tariff exercise, based on the new two-part tariff formula announced recently by the government. But it is quite likely that the state government's reservations will also be taken into account in the recommendations. The calculations will take into account the recent hike in the rate of return for public sector power companies from 10 to 12 per cent. The revision of power tariffs has been long over due. In most cases, the first series of price agreements signed during the period 1982-85 are still continuing without any modifications. These agreements were mostly between the State Electricity Boards (SEBs) and the National Thermal Power Corporation (NTPC) for the first series of 200 mw power units that came up in Singrauli, Korba, Ramagundam and Farakka.

No power tariff revisions have taken place since the new series of 500 mw power stations were installed, despite the higher investment costs which should have translated into higher tariff rates. In order to evolve a comprehensive set of norms for fixation of power tariffs, a committee was formed under **Mr. K.P. Rao,** who was then a member of the CEA. The Rao committee recommendations were subsequently modified to take into account the need for attracting private sector investments into the power sector. The new norms will calculate the tariff structure, taking into account the fixed and variable costs of a power plant. Normative efficiency norms on consumption of raw material and plant load factors will be applied to arrive at the new tariff rates. The tariff exercise that is now being undertaken is a complex one. Tariff rates will have to be worked out on the basis of fixed and variable costs for individual power units. Rates will be slabbed in terms of efficiency.

Sources said that as far as the central stations in the Southern region is concerned, the increase could be in the range of 15 per cent, because of non-revision of tariffs for over a decade. It is not yet known whether the liquidity position of central utilities, like the National Thermal Power Corporation (NTPC), will improve with the notification of higher tariff rates. The SEBs have shown a market reluctance to pay up outstanding bills, worth a massive Rs. 1,200 crores — throwing NTPC into a severe financial crisis. Whether an increase in tariff rates will lead to better liquidity of generation corporations or would merely go to add to dues which are already piling up, only time will tell.

New packaging unit coming up near Gurgaon

Innovative Tech Pack Ltd. is setting up a Rs. 7-crore project to manufacture plastic bottles, wide-mouth jars and pilfer-proof caps at Roz-Ka-Meo Industrial Estate near Gurgaon.

The company will produce, for the first time in Asia, bottles which could withstand filling temperature upto 90 degree centigrade, which is essential for juice packaging in order to avoid environmental contamination. The unit will use injection stretch blow moulding process by importing the plant and machinery from Nissei ASB Machine Co. Ltd., Japan. The technology for the preparation of various formulations is from world leaders in the chemical compounding business. The company will also be the first in India to produce modified PVC with a special molecular weight plastic. The plastic light weight crystal clear bottles will be used for packaging of mineral water, edible oil, juice-based-drinks, pharmaceuticals and full range of cosmetics. Wide-mouth jars will be used for packaging of spices, jams, spreads, coffee, tea and for domestic use.

The installed capacity of the unit in the first will be 60,00,000 bottles. In second phase, the company will produce 60,00,000 bottles, 30,00,000 jars and 1,50,000 caps. The company is in the final stage of implementation of its first phase and commercial production is expected to start in August. The factory building is complete and machinery from Japan is slated to arrive by the June-end.

The entire production from the first phase of project is completely tied-up with large companies engaged in the business of mineral water, carbonated drinks and edible oil. The company has no spare capacity to accept further orders and to produce wide month jars. For the first phase, the company has already tied-up its financial requirements by way of equity of Rs. 90 lakh and term loan of Rs. 1.88 crore from Haryana State Industrial Development Corporation and Haryana Financial Corporation. For the second phase, which will double the existing capacity, the project cost is estimated at Rs. 6.99 crore. The second phase is proposed to be financed through Rs. 1.88 crore term loans and Rs. 5.11 crore equity.

INDIA THE LARGEST PARTICIPANT IN ARABPLAST '92

India's All India Plastics Manufacturers' Association is so far the largest participant at the Arabplast '92, an exhibition being held at Dubai in November. The Indian participants have reserved one fifth of the display area with a similar space booked by the Taiwanese companies together with the Italian companies. With 80 per cent of the display space already booked five months ahead of its opening, Arabplast '92 is all set to hold the Arab Chemical Exhibition and the International Surface Treatment Exhibition. The exhibition is scheduled to open on November 22 at Dubai's prestigeous World Trade Centre.

According to **Mr. Fayez Ahmad,** Managing Partner of Al Fajer Information and Services who are the organisers, 138 companies from 16 countries have already confirmed their participation for the five day event.

He said that the total number of participants is expected to cross the 200 mark, as confirmed by ongoing negotiations. The exhibitions to be held for the first time in the Gulf are expected to draw significant number of decision makers from the Middle East, India, East Africa, Eastern Europe and the CIS countries.

J.K. Petrochemicals tie-up with Krupp gets clearance

J.K. Petrochemicals Limited, promoted by the Singhanias of J.K. Synthetics, has tied up with Krupp Koppers of Germany for implementing the engineering design of the Saleempur petrochemicals project for the manufacture of PTA. The crucial approval for the project has come after a wait of nearly two years by the company. It had applied for the technical tie-up with Krupps in June 1990. However, it obtained the approval only recently, according to company sources.

The technical tie-up would enable speedier work on implementation of the prestigeous Singhania venture for setting up of the Rs. 1,250 crores aromatics complex in Uttar Pradesh for the manufacture of PTA and paraxylene. Krupp Koppers is an approved engineering contractor of Amoco Corporation of the US, which has agreed to supply the technology to J.K. Petrochemicals for the manufacture of PTA. J.K. Petrochemicals has also signed an MoU with Universal Oil Products Inter Americana Inc. of the USA for supply of the Aromatics process units.

With most of the technology tie-ups now in its bag, work on the Rs. 1,250 crore Saleempur aromatics project is likely to pick up, according to company sources. The company has received the requisite sanctions from the state government for its requirement of water and power for the project. The project will draw its water from the upper Ganges canal, according to these sources.

The company has also managed a 'no objection' certificate from the Uttar Pradesh Pollution Control Board. The resource crunch notwithstanding, J.K. Synthetics Limited is thus going ahead with the implementation of its pet project which was earlier believed to be heading for a massive cost and time overrun.

BRPL PROFIT UP 34 PER CENT

The Bongaigon Refinery and Petrochemicals Ltd. (BRPL) has earned a gross profit of Rs. 65.18 crore in 1991-92 which was higher by 34.5 per cent compared to the previous year.

The sales turnover of the company went up by 12.5 per cent from Rs. 415 crore in 1990-91 to Rs. 467 crore. With a tax incidence of Rs. 29.20 crore, the profit after tax for the year was Rs. 35.98 crore. The Board of Directors maintained the dividend at Rs. 10 crore. The production of paraxylene is 26,074 tonnes (previous year 23,107 tonnes), DMT 40,625 tonnes (40,340 tonnes) and PSF 10,397 tonnes (5,030 tonnes) were the highest ever achieved by the company.

The crude throughput at 1.16 million tonnes, although marginally higher than the previous year's figure of 1.14 million tonnes, continued to be constrained by crude availability. DMT sales and captive consumption totalled 40,780 tonnes (36,556 tonnes). Polyester Staple Fibres (PSF) sales at 11,440 tonnes, was twice that of the previous year's figure of 5,718 tonnes.

The refinery expansion from 1.35 million tonnes of crude throughput to 2.35 million tonnes has been approved by the Government in December 1991. According to the company, the work is progressing as per schedule and is expected to be completed by December 1994.

TAMIL NADU PETROPRODUCTS POSTS NEGATIVE PROFITS GROWTH

The joint sector Tamil Nadu Petroproducts Ltd. (TPL) has shown mixed results for the year ending March 31, 1992. While the sales turnover has appreciated to Rs. 279.75 crore duri the year 1991-92, from Rs. 228. crore, other income rose sharply fr Rs. 92.52 lakh to Rs. 2.94 crore.

Gross profit before interest a depreciation improved marginally to F 67.25 crore from Rs. 66.89 crore. Wi no tax liability, net profit declined to F 19.61 crore from Rs. 20.33 crore. Inte est charges were higher at Rs. 22. crore (Rs. 19.81 crore) and depreciati was lower at Rs. 25.47 crore (R 26.48) crore.

The balance carried forward to t balance sheet after these appropriatio is marginally lower at Rs. 5.94 cro against Rs. 6.11 crore. The compar enjoys a comfortable reserve of R 35.95 crore (Rs. 23.65 crore). Durin the year, the company shut down the la plant for two months in order to revam the operations and upgrade the capa city to 75,000 tonnes from 52,40 tonnes.

Therefore output came down t 69,321 tonnes. The outlook for the cu rent year is considered reasonable as th benefits of the revamping carried ou last year and this year for increasing th production of paraffin would be realise by the second half of this year. Th company is looking at various avenue available for expansion and diversifica tion.

QATAR SHOWS INTEREST IN PETROCHEM VENTURES

Qatar expressed great interest in pet rochemical ventures in India. Qata **Amir Shaikh Khalifa** himself told the visiting Indian Minister for Externa Affairs, **Mr. Eduardo Faleiro,** tha while his country would look into the possibility of setting up joint ventures with India to take advantage of the lib eralised climate there, it could also supply gas to India. This Gulf state ha among the largest reserves of gas in the world.

Single point sales tax on plastics favoured in West Bengal

The plastics industry in West Bengal has urged the Centre to persuade the State Government to abolish entry tax on basic raw materials and impose a single point sales tax in place of multi-point sales tax. The small scale units have to depend on supply of raw materials from far off places from the centre of production. Small entrepreneurs hence are subjected to both octroi as well as multi-point sales tax. According to the Indian Plastic Federation (IPF) President **Mr. I.C. Dixit,** the multi-point sales tax should be abolished in the interest of those small scale industry (SSI) units, who are under the purview of the thrust sector.

More than 90 per cent of the industry's processing units are in the small scale, cottage and tiny sectors, and are reeling under high-cost and high-price constraints. Moreover, more than half of the units are in the unorganised sector, and are running much below the capacity utilisation. Mr. Dixit said that the Kerala Government in their new industrial policy has provided for a tax growth fund. This enables the small scale entrepreneurs to deposit their taxes voluntarily in the fund, and obtain support for expansion, diversification, and modernisation.

The IPF President urged other states to initiate the formation of such funds, and suggested that the scheme be considered at the Central fiscal level. This concept could be inducted in tiny units in electronics, software, apparel, plastics and communication, he said. According to him, implementation of this fund will consolidate steps towards self-regulation, and "self assessment", which are being considered in the policy reforms for the small scale sectors. Making a reference to turnover tax SSI units, Mr. Dixit said that th States who have not yet abolished should consider doing away with turnover tax.

He also stressed on the small un getting a 15 per cent price preferen vis-a-vis large scale units in the cou try. In cases of supplies by SSI units medium and large private sector co panies and Government undertakings is seen that the stipulated period payment in the supply order which normally 60 to 90 days is not adher to, and payment is often delayed beyo eight to ten months. This causes har ships to the already ailing industry, M Dixit said. He suggested that paymen to the SSI units within the stipulat period should be made obligatory by Central legislation. Further the proce of application, banking and institution finance procedures should be simplifi so as to enable the industry to get ea access to finance, he said.

Assam refinery to be funded largely by equity issue

The Assam Government would tap ie capital market to raise Rs. 1,450 rores for financing the proposed fourth il refinery in the state, being set up jintly with IBP Co. Limited. The pro-ct was proposed for implementation in ie Eighth Plan along with the Karnal efinery and Mangalore Refinery and etrochemicals Ltd.

Officials from the Assam government nd IBP recently invited proposals from eading merchant bankers for floating ne massive public issue, the largest so ar in the Indian capital market. The ssam refinery project, slated to come p at Numaligarh in the state, is esti-nated to cost Rs. 1,800 crores for a efining capacity of three million tonnes er annum. In a significant decision, the romoters of the project have decided o fund almost the entire plant through ubscriptions from the public.

The decision to tap the primary capi-al market for funding refinery projects re significant in view of the truncated inancial support from Central Govern-nent to the oil sector in the Eighth Five ear Plan. The Planning Commission ad pruned the oil sector allocation to s. 32,000 crores from the originally equested Rs. 50,000 crores during the lan. Out of the allocation for the oil ector, only a token allocation was made or implementing refinery projects, vhich were expected to raise their own esources.

In view of the capital intensive nature f these projects, doubts had been raised bout their ability to raise adequate esources. However, the recent success f Mangalore Refinery and Petrochemi-als Ltd. (MRPL) in tapping public ınds has raised confidence in the oil ıdustry circles.

However, the failure of MRPL's on-convertible portion of the public fer has forced merchant bankers to re-think the proposal and design suitable investment instruments for long gestation projects like the refineries. With MRPL already on its way to implementation and Assam refinery set to enter the market, only the Karnal refinery, biggest among the three and earlier proposed to be set up by the Tatas, awaits implementation.

IBP Co. Ltd. proposes to hold nearly 26 per cent of the equity stake in the Assam refinery while the state government has decided to reduce its stake to only 10 per cent on account of resources constraints. However, the Chief Minister of Assam, **Mr. Hiteswar Saikia,** is reported to have assured local leaders that the government would retain control over the administration of the new company.

IBP, formerly Indo Burma Petroleum Co. Ltd., is a public company listed on the Bombay and Calcutta stock exchanges with a paid-up capital of Rs. 73.59 crores. However, a majority of its stake (76.26 per cent) is controlled by the government and financial institutions while 18.60 per cent is held widely among the public. IBP had a shareholders' reserve of Rs. 64.25 crores as of last year with net profit of Rs. 7.72 crores on a sales turnover of Rs. 984 crores. A 26 per cent equity holding of IBP in the refinery project could require an investment of nearly Rs. 100 crores by it, while the Assam Government has provided for an investment of Rs. 51 crores in the project.

HALDIA PETROCHEMICALS: TECHNOLOGY ARRANGEMENTS TO BE FORMALISED SOON

The agreements between Haldia Petrochemicals Ltd. and three foreign licensors, namely, Mitsui of Japan, Himont of Italy and Lummus of the United States are to be signed soon. Mitsui will supply technology for HDPE, Himont for polypropylene and Lummus for the naphtha cracker. Negotiations are on with three other firms, namely Du Pont of Canada, DSM of Holland and BP Chemicals of Britain, to secure technology for the LLDPE plant.

The selection of the licensor for LLDPE is expected to be finalised by the end of this month, it is learnt. Since benzene and butadiene are not included in the first phase operation, there is no urgency in regard to selection of licensor or signing of agreements for these plants. Once the agreements have been signed with the foreign licensors supplying technology for cracker, HDPE and PP plants, the question of foreign exchange will automatically arise, partly for payment of knowhow fees to them and partly for placing orders for imported equipment.

The Union Government is understood to have indicated to provide about $100 million of loan at the official exchange rate. HPL authorities have also submitted to the World Bank, its affiliate IFC and the Asian Development Bank the revised cost estimates for the project for securing assistance from them. Even as HPL awaits replies from the multilateral agencies, efforts are underway to secure from the Centre as much foreign exchange as possible at the official rate. The foreign exchange component of the project is estimated at $650 million.

Meanwhile, **Mr. Bidyut Ganguly,** West Bengal Minister of State for Commerce and Industry, has gone to Haldia to expedite the rehabilitation of those evicted from their homesteds following acquisition of lands for the petrochemicals complex. A total of 650 families are to be evicted and all of them have been paid compensation as per rules by May 15. About 100 of these families are believed to have already moved into the new rehabilitation colony, while steps are being taken for speedy resettlement of the rest.

RIL refinery gets Government approval

The Centre may drop its proposal to set up a grassroots oil refinery in the western region reports *The Economic Times*. This follows clearance of a 9 million tonne refinery of the Reliance Industries Limited (RIL) by the Foreign Investment Promotion Board, recently.

The government was planning to set up three grassroots refineries, one each in central, eastern and western regions, during the Eighth Plan period. These were planned keeping in view rise in demand in petroleum products in the respective regions. According to government officials, a six-million tonne refinery proposed to be set up by IBP Limited in Gujarat will not be required after the clearance of a 9-million tonne refinery by RIL which would be enough to meet the demand of the western region.

This also reflects the government's keenness to gradually vacate the area of petroleum refining for the private sector. The government's resoures can be utilised elsewhere, sources point out. The Petroleum Ministry has also begun an exercise to prepare its views on privatisation of refining sector, though it is believed that privatisation of the marketing network will not be possible in the near future. However, it is believed that by the time new refineries are commissioned, the administrative pricing system may be abolished. This would mean automatic privatisation of product marketing.

The Petroleum Ministry is siezed of various proposals from private sector for setting up a refinery in the eastern sector. If a decision is taken that the private sector may be allowed to set up a refinery in the eastern sector, the Petroluem Ministry will have to withdraw its proposal for a refinery in that region to be set up by the Indian Oil Corporation. IOC is already involved in setting up a grassroots refinery in Karnal which is also of six-million tonne capacity. Though the Petroleum Ministry was keen on setting up new refineries in the joint sector, the Finance Ministry seems to be pushing hard to expedite foreign investment. As a result, the RIL proposal was expeditiously cleared without taking into consideration that the Petroleum Ministry had planned one in the central region already. Sources point out that while private sector participation is welcomed, the public sector oil companies, which have gained vast experience over the years, should not be ignored. The Ministry's objective is to create a refining capacity of at least 90 million tonnes by the end of the Ninth Five-year Plan.

Officials also point out that private sector companies should also have a committed production schedule and manufacture all those products which are in demand in that particular region. Otherwise, private sector companies will be attracted towards manufacturing of "hot-selling" middle distillates such as diesel, kerosene and aviation turbine fuel (ATF), ignoring other products.

RIL TO RAISE FUNDS FOR OIL REFINERY PROJECT FROM PUBLIC

The first private sector oil refinery to be set up by Reliance Industries Limited (RIL) and C. Itoh of Japan will have an annual capacity of nine million tonnes and will not rely on any fund from Indian banks or financial institutions. The Foreign Investment Promotion Board (FIPB) approved the proposal recently. The proposed refinery, costing about Rs. 4,500 crore, will meet its funding requirements from equity, public subscription and foreign loans. A large part of the $350 million foreign exchange needed for the refinery will be met through equity contribution of C. Itoh. C. Itoh will lead a consortium of foreign oil companies like British Petroleum, Exxon and Aramco. The pattern of equity share among these companies will be determined by C. Itoh. But the total equity holding of C. Itoh will be the same as that of RIL. The remaining equity of the new company to be floated for implementing the project will be raised from public.

The proposal for the refinery project envisages processing 60:40 Arabian light and heavy crude and produce from it liquefied petroleum gas (LPG), naphtha, gasoline, kerosene, diesel, fuel oil and asphalt pitch for sale in the Indian market. The location of the refinery is likely to be on a coastal site in Gujarat. The grassroots refinery will market its products in India as per the prevailing marketing rules at the time of its commercial production. According to the current plan, the project is scheduled to go on stream by early 1996.

The demand-supply-gap of LPG and naphtha is expected to be around 1.12 million tonnes by 1994-95 and the gap for other middle distillates will be over nine million tonnes in 1994-95.

The investment by C. Itoh in the refinery will market the single largest foreign investment by any company in the country. This is also expected to pave the way for more foreign investment in similar core areas of the economy. C. Itoh is an international trading giant with 760 affiliated companies. Its turnover in 1991 was estimated at over $150 billion.

CENTRAL EXCISE & SALT ACT AMENDED

The government has amended the Central Excise and Salt Act, 1944, by way of replacing licensing with one-time registration with effect from May 21. According to an official release issued recently, under the new system no renewal of registration would be required. This has been done with the objective to facilitate smooth transition from licensing simplified registration system. In order to have speedy implementation of the new scheme a special counter has been opened in each range office with effect from June 1.

HBJ gas utilisation expected to improve

After a series of inter-ministerial meetings, the Petroleum Ministry has concluded that all projects along the Hazira-Bijaipur-Jagdishpur (HBJ) pipeline will come up in time and utilise the gas. The review of the projects along the HBJ pipeline was made after the Prime Minister, **Mr. P.V. Narasimha Rao,** expressed his concern over the flaring of natural gas. According to an internal note prepared by the Petroleum Ministry the current production of natural gas in the country is 49 million cubic metres per day. "Unfortunately, the use is around 39 million cubic metres per day only". According to the note, rest of the gas is being flared not due to lack of customers but lack of infrastructural facilities.

The allocations of gas along the HBJ pipeline and ex-Hazira are 36.35 mmscmd and 11.9 mmscmd, respectively. So far, under-utilisation of the HBJ pipeline has been a cause of worry. The position is, however, changing rapidly and would be reversed soon, the note adds. The handling capacity of the Hazira Gas Terminal (HGT) is 20 million cubic metres per day and the gas from here is either supplied to industries at Hazira or fed into the HBJ pipeline. Of the 20 million cubic metres of gas available per day from the HGT, almost 17 million cubic metres per day is already being utilised, leaving a balance of just over three million cubic metres.

The Ministry is confident that the following plants along the HBJ will soon commence using gas:

* NTPC, Dadri (3 mmscmd), is mechanically complete and has been synchronised recently. It is expected to draw approximately 1.5 mmscmd from 1992-93, and its full allocation of 3 mmscmd from 1993-94;

* Maruti Udyog Limited (0.5 mmscmd), is in advanced stages of completion and is expected to start drawing at least 0.3 mmscmd gas from April next year and its full allocation of 0.5 mmscmd from 1993-94;

*Delhi industries (0.9 mmscmd), are currently undergoing conversion, and are expected to start drawing at least 0.5 mmscmd from next year;

*IOC, Koyali (1.1 mmscmd) is expected to start drawing 0.3 mmscmd shortly and full allocation by 1993-94.

* Vagodia LPG (0.2 mmscmd) is expected to be commissioned in the last quarter of next year.

Apart from these, there are projects which have already made large investments, and which, though delayed, would certainly come up 1993-94, the note says. These projects are:

* Chambal Fertilisers, Gadepan (1.8 mmscmd), is now scheduled for commissioning at the end of 1993. It is understood that more than Rs. 400 crores has already been committed or invested in the project;

*Usha Rectifier, Jagdisphur (0.8 mmscmd), is now likely to be commissioned by early 1994. It is understood from promoters, the note adds, that an expenditure of Rs. 60 crores has already been incurred on the project.

Secretary, Department of Steel has also confirmed with Secretary of Petroleum and Natural Gas that this project would come up according to the revised schedule;

* After the utilisation by these projects is complete, internal use for compressors will also go up by another 0.95 mmscmd.

These projects will consume a total of 20.95 mmscmd by 1993-94. The ministry has committed another 15 million cubic metres for use beyond 1993-94. These projects mainly include Tata Fertilisers (1.8 mmscmd), Bindal Agro (1.8 mmscmd), IIFCO/NFL expansion (3.6 mmscmd), DESU at Bawana and NTPC at Faridabad (4 mmscmd), GAIL Petrochemical (2 mmscmd).

Crude shipment at market rates preferred

Indian shipowners have unanimously expressed their preference for market-driven freight rates for the carrige of crude oil cargoes over the prevailing cost-plus formula being followed by the Oil Coordination Committee (OCC), which awards transport contracts.

The shipowners voiced their opinion at a meeting held at Bombay by the Tonnage Acquisition Committee (TAC) on June 5, where officials from Essar Shipping, Great Eastern Shipping, the OCC the Oil and Natural Gas Commission, the Director-General of Shipping and the Shipping Credit and Investment Company of India were among those present.

Informed sources point out that the current world market tanker freight rate is almost half that of the cost-plus rate being paid by the OCC. Tanker freight rates, worked out on the basis of cost-plus formula, cost the OCC around $32,000 a day for each ship, whereas the prevailing market rate is in the region of $16,000 a day. Thus, if the OCC switches to the market rate, the nation's exchequer will be richer by $6 million annually for every ship that is employed.

The cost-plus formula, orginally proposed by the World Bank in 1972 when it offered a $85 million loan to the country's shipping industry for building tankers, allows tanker owners (a) all short-term variable costs, (b) all long-term variable costs, (c) recovery of equity at 12 per cent annually, and (d) recovery of loan at 8.5 per cent plus a three per cent service charge. This largesse, which eventually found its way to the SCI, is equivalent to buying a government bond carrying a coupon rate of between 24 and 30 per cent, says an industry insider.

It is learnt that **Mr. D. Afzalpurkar,** the D-G Shipping, contended at the meeting that under the cost-plus regime ship-owners were not cost-conscious and tended to spend indiscriminately on operations, repairs, etc.

ONE MORE TANKER PURCASE URGED

India will require one additional Suezmax tanker, with a capacity to carry one million barrel oil, for carrying national crude imports during the Eighth Year Plan. The proposal was made by the Great Eastern Shipping Co. (GESCO) and the Shipping Corporation of India (SCI) at a meeting of the Tonnage Acquisition Committee (TAC).

According to informed sources, the TAC which met earlier in April and recommended that no additional tankers will be required during the Eighth Plan period, did not provide for berthing delays which are experienced by the ships calling at the ports. The committee had provided for only 15 per cent contingency, which included engine breakdown and other repairs but excluded berthing delays (which increases the number of voyage days). Subsequently, GESCO and SCI made independent assessments of berthing delays encountered in the past two years.

According to SCI, 15 per cent contingency should be provided for berthing delays alone, whereas GESCO puts the figure at 23%. After taking into account berthing delays faced by other tanker operators (Essar and Ratnakar), the average was worked out to be around 17 per cent. Thus, the two companies contend that total contingency should be of the order of 30-32 per cent for 330 operational days in a year. The committee in its earlier meeting had recommended requirement of only two Suezmax (1,40,000 dwt) tankers. In the event of the committee accepting the reworked proposals, GESCO stands a considerably good chance of obtaining a contract for a Suezmax tanker that it proposes to acquire.

CIL to step up exports to SAARC nations

Coal India Ltd. (CIL) plans to increase exports to the SAARC countries of Nepal, Bangladesh, Bhutan, Sri Lanka and Pakistan and in the process double the export in the current year, **Mr. Subodh Sen,** Chief General Manager (Marketing) said in Calcutta on June 3.

The target is to export about 400,000 tonnes of coal from the country in 1992-93, which would in effect more than double the quantity of export compared to the previous year. To achieve this target, CIL has set up an export cell and fresh recruitments have started to man the cell.

The Coal India is laying stress on exports because it not only leads to the earning of hard currency but also fetches a higher unit price compared with the sale in the domestic market. All the SAARC countries, however, do not pay in hard currency. Bangladesh, for example, does but Nepal does not. To increase the export of coal to Nepal, a top level CIL team, led by its Chairman, visited Kathmandu last month. CIL officials suggested to the Nepal Government that a series of mini thermal power stations could be set up at the border areas of Nepal with coal supplied from CIL.

The plan is to increase the export to Nepal from 90,000 tonnes in 1991-92 to 200,000 tonnes in 1992-93. Nearly three-fourths of the domestic energy needs in Nepal are met from firewood and 20 per cent from cowdung and other organic sources. About four per cent is hydel power. Such overwhelming dependence on firewood is leading to a high degree of deforestation in Nepal, which is detrimental to the interest not only of Nepal but of the entire subcontinent.

Under the circumstances, CIL can increase the export of coal bricks to Nepal to meet the domestic power needs of the Himalayan kingdom. The bricks can be made available from smokeless fuel plants. There is demand for Indian coal from the cement plants and brick fields in Nepal as well.

Besides, mini power plants based on fluidized bed technology can be set up in the border areas between the two countries where Indian coal can be transported up to the railheads on the Indian side by rail. Such power plants can be run even on low grade coal. Reduction of dependence on hydel power would help maintain the ecological balance in Nepal. Nepal, of course, buys high grade coal too from India and this is traditionally supplied from the Ranigunj collieries of the Eastern Coalfields and from the Bharat Coking Coal. With increased demand from Nepal, coal is now being supplied increasingly from Assam which has a direct metre gauge rail link with the border areas of Nepal. In the future, CIL plans to supply from the Singrauli coalfields in Uttar Pradesh to Nepal.

In July, another CIL team would visit Bangladesh to explore the possibilities of increasing export. Presently, coal is despatched to Bangladesh mainly along the land routes, but now the possibility of sending through the waterways is being discussed. A preliminary meeting with the Central Inland Water Transport Corporation has been held. For the Coal India, of course, it is more important to tap the rather big Pakistani market. The per capita energy consumption in Pakistan is almost the same as that in India, according to sources, and therefore the total energy requirement of the country is also high. Presently, Pakistan is importing coal from Poland and South Africa. It is difficult for India to dislodge these traditional suppliers because India cannot match in quality in coal, they have to offer. But India would surely have a price advantage. The entire plan is however, dependent on improvements in Indo-Pak relations.

Drug producers seek upward revision of prices

The Organisation of Pharmaceutical Producers of India (OPPI) has urged the Prime Minister **Mr. P.V. Narasimha Rao** to appoint an independent technical committee, under the chairmanship of a financial expert, to assess the profitability of the drug industry.

In an attempt to dispel the notion that drug firms are making exhorbitant profits, OPPI has presented the findings of a survey of 32 of its member companies (mainly multinational subsidiaries) contesting this fact. The memorandum is also part of an effort to urge the government to review the Drug Price Control Order (DPCO), to allow for higher prices for formulations under this category.

Interestingly, though the memorandum provides facts to show that these companies face low-profitability levels, the findings of a recent Exim Bank of India portrays a different aspect to it. The Exim Bank study findings reveal that the larger the size of the multinational's firm, the greater the profitability.

The OPPI survey also covers the leading multinational firms in India which it says accounts for 45% of the total drug sales in the country. The OPPI survey reveals that the total companies profit before tax as a percentage of total company net sales declined from 5.8% in 1989-90 to 5.1% in 1990-91.

However, if non-pharma activities like agro-chemicals, pesticides, food products and other non-pharma items are excluded, this percentage comes to 3.3 per cent. If the sales accruing from exports are excluded from the calculation of profit before tax and only domestic activity is considered, the figure comes down to an "alarmingly low" level of 2 per cent. Significanlty, according to an OPPI memorandum, this compares poorly with even the permissible level of profitability of 8 to 13 per cent allowed under the DPCO, 1987.

MOREPEN LAB DECLARES 18 PER CENT DIVIDEND

Morepen Laboratories Ltd. (MLL), engaged in the manufacture of life saving bulk drugs, has declared a dividend of 18 per cent for the year ended March 31, 1992. During the year, the company achieved an increase in sales and other income from Rs. 9.13 crore to Rs. 13.24 crore, registering a growth of 45 per cent. The profit before tax at Rs. 87.3 lakh registered a growth of 139 per cent over the previous year's profit of Rs. 36.61 lakh, owing to a low break even point.

On the export front, the company registered a growth of 594 per cent increasing exports from Rs. 13.27 to Rs. 95.27 lakh. The Rs. 10 per value equity share of the company has a book value of Rs. 32.26 as on March 31, 1992 and an earning per share of Rs. 17.46. During the year under review, the company added fixed assets worth Rs. 38.86 lakh from internal accruals bringing the gross block to Rs. 146.55 lakh.

Against this, the company has an outstanding term loan of Rs. 16.58 lakh. The company, therefore, has a lower interest cost. The replacement cost of the present plant is estimated at over Rs. 5 crore giving the company an advantage of low fixed costs.

To meet the growing demand of the company's products, the company is setting up new facilities for bulk manufacture of cephalexin, 7 ADCA and CIMC chloride, an import substitution product, at the existing location. The company has proposed to establish a new pharmaceutical facility for export of bulk drugs.

Pharmaceutical exports to Russia yet to take off

Drug exports to Russia are severely crippled thanks to the Russian Government dragging its feet on the issue of opening Letters of Credit (LCs). Despite a US $100 million provision for medicines in the Indo-Russian trade protocol in the first quarter of this year, the Russian Government has, only recently opened LCs worth US $23 million for one particular drug.

The LCs opened recently are for insulin, a priority item for the Russians. Thus, nearly three months after Medexport, the central agency dealing with drugs and pharmaceuticals was in India on a buying mission and had placed orders worth nearly Rs. 300 crore, drug exports are yet to take of substantially.

A spokesman of Boots India Ltd., a major manufacturer of insulin in the country, says that they are yet to receive intimation of the LCs having been opened and expects to get confirmation by middle of June. He however admitted, that though Boots had been a major exporter to Russia, it was no longer a major player in the Russian market having been overtaken by Torrent Labs, Ahmedabad. The Russians have, in the last couple of years, shown a preference for the highly purified insulin manufactured by Torrent, he points out.

Most drug manufacturers at Bombay say they prefer to wait for the LCs instead of commencing production of drugs earmarked for Russia. However a few manufacturers are going ahead in the belief that the Russians have never backtracked on their word. Industry sources say once export of oil from Russia commences, the Russians will be in a better position to import drugs from India. In which case priority will be accorded to liquid injectables. Russia will necessarily have to import these formulation before the onset of winter, as they tend to crystallise. The trade protocol specifically states that exports from India (under the protocol) will have to necessarily be carried out through LCs issued by Vneshtorg Bank, the central bank of the Russian Federation. These have to be confirmed by Indian banks having accounts of the Vneshtorg Bank.

However, it has not been made clear whether the value addition criterion of 233 per cent for drug exports to Russia still continues. In the last couple of years, many manufacturers have preferred not to export to Russia because they find this criterion "unattainable". The Basic Chemicals Pharmaceuticals and Cosmetics Export Promotion Council (CHEMEXCIL) has fixed a provisional target of Rs. 1,200 crore of exports to Rupee Payment Areas (RPA) in 1992-93 against Rs. 700 crore in 1991-92. As of April this year, Rs. 8 crore worth of goods have already been exported to RPA countries.

DRUG TO PREVENT ELEPHANTIASIS DEVELOPED

What is claimed to be the world's first anti-filarial drug that will prevent elephantiasis is on the way from the Central Drug Research Institute (CDRI) in Lucknow. When it becomes available it will be a boon to millions of filariasis victims who can potential develop the end-stage elephantiasis characterised by massively swollen limbs.

Elephantiasis is caused by adult filaria worms lodged in the lymphatic system. Currently available anti-filarial drug kill the young ones (microfilarie) circulating in the blood stream but are ineffective against the adult worms. The CDRI drug is said to be the first known compound that kills not only the microfilarie but also the adult worms thereby preventing elephantiasis.

Vitamin C imports at lower duty likely

The Ministry of Chemicals and Fertilisers is seriously considering import of Vitamin-C as an option to tide over the current shortfall of this controlled drug in the market according to a report appearing in *The Financial Express*. The current short supply is reportedly due to the under capacity production by Jayant Vitamins and Sarabhai Chemicals, the two units manufacturing this bulk drug.

Besides, it is alleged that the two units are diverting the controlled drug to the food sector in order to recoup the losses incurred due to the "unrealistic" pricing of Vitamin-C as it belongs to the category of drugs under the controlled pharmaceutical sector. Sources in the Deparment of Chemicals and Petrochemicals of the Ministry said the idea of importing Vitamin-C is being toyed with as the formulators were pressing for supply of the bulk drug. While there is no bar on the import of Vitamin-C, the duty levied is a phenomenal 110 per cent. The Ministry hopes to make the "one-time" import, paying a lower duty for which it will have to seek the permission of the Ministry of Finance.

Drug industry sources allege that while the two units have cause to be unhappy about the pricing as it does not match the inputs for production, nonetheless the formulators are being put to hardship "because of diversification of the bulk drug for products other than pharmaceuticals like soft drinks, nutrition enriched formula drinks and supplements, besides other food items."

The *modus operandi* employed for diversification is to process the notified Indian Pharmacopaea (IP) formula drug in such a way that it no longer falls in its purview. The food sector not being under controlled category, the manufacturers are able to get a good, remunerative price. In the last few months there has been a steady decline in supply of the bulk drug to the formulators as a consequence of which Vitamin-C has become scare in many areas.

On receipt of several complaints, in April the Ministry officials held a meeting with the industry representatives comprising the two Vitamin-C manufacturers and the formulators to assess the situation. The producers were categorically told to produce the required quantum of pharmaceutical grade Vitamin-C to match the demand of the formulators.

According to **Mr. Rajagopalan,** Delhi representative of Jayant Vitamins, they had given a written undertaking to comply with the Ministry's directive. He refuted reports from the drug industry that bulk of their output was being diverted to the food sector to compensate for high production costs. "There has been no diversion over and above what was being supplied to them over the last few years," stated Mr. Rajagopalan. He added that they supply both pharmaceutical grade Vitamin-C at notified price and the non-pharma formula to companies like Glaxo which make both the drug as well as the formulations.

Vitamin-C being a controlled item, there is not much profit for the manufacturers and this, in part, is blamed for the under capacity production. There is also the view that the notified price is not adequate. As the spokesman of Organisation of Pharmaceutical Producers of India put it: "They are not getting a remunerative price for their product."

"How long can a unit continue to generate loss and survive," **Mr. T.R. Grover,** area manager of Sarabhai Chemicals, sought to know. According to him, the current shortage is because of production loss for a few months in the recent past. The unit had now resumed normal production and the market position is likely to improve, the spokesman said.

207 crores loss due to fall in SSP production

The decline in the production of single superphosphate has cost the country Rs. 207 crores during 1991-92 and it is feared that this will rise with the number of closed units rising to 40 in the last two months.

In addition, the country is also having to shell out Rs. 125 crores in foreign exchange for importing 2.44 lakh tonnes of diammonium phosphate to make good the shortfall in production of phosphatic fertilisers. Against a target of 2.7 million tonnes of phosphatic fertilisers, only 2.5 million tonnes were produced in 1991-92.

The suspension of payment of subsidy arrears since June 1 has come as the latest blow to the industry in which nearly half of the manufacturers have downed shutters. Among the units which have closed 15 are in the standard sector and 25 in the small-scale sector.

In fact the industry has been operating at sub-optimal levels since August when an arbitrary ceiling on subsidy, which was below the cost of production and distribution, was imposed. The ceiling was effective July 25, 1991.

As a result of this decision, SSP production declined by 30 per cent between August 1991 and March 1992 compared to the corresponding period in the previous year. Between April and July 1991, prduction had increased by 8.5 per cent when compared to the corresponding period of the previous year.

Industry sources say that the decision had caused a production loss of nearly seven lakh tonnes. In fact, this could be nearly 10 to 11 lakh tonnes, if the annual growth rate of eight per cent is considered. In monetary terms, this works out to a colossal loss of between Rs. 295 crores and Rs. 325 crores, if the cost of production and distribution is taken to be Rs. 2,950 per tonne. Adding to th woes of the SSP units has been the dec sion to decanalise the imports of ra materials like sulphur and rockpho phate. Earlier, when imports were mad by the MMTC, SSP units had th advantage of an easy credit facili which is now lost to them.

Two other factors which have ser ously affected SSP units are the esca ating costs of various inputs and utilitie over the last 17 months and the irregu lar payment of subsidy dues. For standard unit of 66,000 tonnes pe annum capacity, on an average abou Rs. 3.5 crore has been locked up o these two counts. Thus, the total amour said to be locked up is around Rs. 15 crores. Due to this, single superphos phate units are facing a serious liqui dity problem and are unable to pay eve for raw materials.

GNFC RECORDS IMPROVED PRODUCTION

Gujarat Narmada Valley Fertiliser Company (GNFC) has earned th highest-ever gross profit at Rs. 111.2 crores during the year ended Marcl 1992 against Rs. 66.50 crores, showing a jump of 67 per cent. The pre-tax profi has shot up by 102.5 per cent t Rs. 51.96 crores from Rs. 25.66 crores The dividend has been stepped upto15 per cent from 10 per cent. It has lifted the turnover to Rs. 546.42 crores from Rs. 390.18 crores.

After providing Rs. 11.93 crore towards arrears of depreciation of ear lier year, the net profit is Rs. 40.03 crores. Its total reserves stand a Rs. 156.90 crores. During the year GNFC established 23 new records o highest daily, monthly, and annual pro duction as well as despatch. Th ammonia plant produced 5.10 lak tonnes against 4.19 lakh tonnes and th urea plant 7.17 lakh tonnes against 6.07 lakh tonnes last year.

8th Plan fertiliser imports to touch 38,000 crores

To meet the growing requirement of fertiliser for sustaining agricultural growth, India will increasingly depend on imports during the Eighth Plan period, says the Plan document while projecting an import bill of Rs. 38,493.4 crores during the next five years.

Expressing concern over the widening gap between projected consumption and estimated production, the document says 'adequate private sector initiative is not forthcoming because of lack of a clear cut policy and freedom to decide the feed stock as well as uncertainty about the returns from the investments.'

As a result, the country will have to import 5.5 mt. of nutrients in the terminal year of the Plan (1996-97) to take care of a projected consumption of 18.3 mt. as compared to 2.7 mt. import and 13.5 mt. consumption during the last financial year.

Stating that the capacity for the production of fertilisers has not been keeping pace with the growth in consumption, the document, as approved by the National Development Council, says during the Eighth Plan period the imports of fertilisers and raw materials are projected to grow at the rate of 12.67 per cent.

During the terminal year alone the imports under this head are projected to cost Rs. 8,988.6 crores as against imports valued at Rs. 4,951 crores during 1991-92. Striking a note of concern over the present fertiliser scenario, the document says 'the fertiliser industry will be virtually bypassed by the economic liberalisation in view of the controls on inputs and administered prices of inputs as well as outputs of the industry.'

Stating that ad-hoc adjustments in the norms for 'fixation of retention prices have created apprehensions among the potential investors about the viability of projects, the Plan calls for finalisation of the feed stock and pricing at the earliest. Or else, the country may be heading for increased shortages and dependence on import.

It advocates complete decontrol of prices, saying it can end the subsidy and pricing problem together. This will be in line with the philosophy of greater reliance on market forces and seems to be the most desirable action to solve the problem of subsidies on the one hand and ensure healthy growth of the fertiliser industry on the other.

The document, however, adds that decontrol will have to be accompanied by suitable increases in the procurement prices of agricultural products. At the same time, the Plan warns that decontrol can have an adverse affect on the consumption of fertilisers mainly by small and marginal farmers in the initial years.

Therefore, phasing out subsidy will have to be done gradually giving time to farmers to adjust. It also suggests that group retention prices for newer plants based on gas can be introduced as an interim measure, saying this will be the second best option and it will give incentive to the new fertiliser plants to optimise the capital and operating costs.

Commenting on the retention price mechanism, the document says the industry has also been complaining that though it is assured of a 12 per cent post tax return on net worth, in actual practice a number of items are excluded. Also there are inordinate delays in the release of subsidy, adversely affecting the financial position of the fertiliser companies.

This coupled with apprehensions among the potential investors about the viability of the project have been attributed as reasons for very slow progress in the three fertiliser plants, which were to come up in the private sector along HBJ pipeline in the Seventh Plan.

During the Seventh Plan period, four gas-based nitrogenous fertiliser plants at Aonla, Bijaipur, Jagdishpur on HBJ pipeline and expansion of Namrup III and DAP project at Paradeep, were commissioned. Another four gas-based projects are under implementation.

Even after this, there will be a shortfall of about 3 mt. of nitrogen in 1996-97, even as production goes up from 7.3 mt. to 9.8 mt. by the terminal year of the Plan. The production of phosphatic fertiliser will go up to 3 mt. from present 2.5 mt.,while consumption is projected at 5 mt. leaving a gap of 2 mt. to be met through imports. The raw material reserves for phosphatic fertilisers in the country are negligible, and the choice is to import either rock phosphates and sulphur or intermediates like phosphoric acid or the finished fertiliser itself. The document says that the policy of a judicious mix of import of finished fertiliser and production of fertilisers through raw materials and intermediates will continue.

As the expansion of the existing units provides considerable savings in infrastructure and utilities, doubling of plants at Bijaipur, Aonla and Jagdishpur should be undertaken without further loss of time, the plan document emphasises. Discovery of gas in Krishna-Godavari and Cauvery basin offers an opportunity to add small sized gas based plants in these region. It also suggests that subject to finding an effective transport route, surplus gas available in north-eastern region can be utilised for fertiliser production. Stressing on the need for improving the capacity utilisation, the document says, production of fertiliser during the Eighth Plan has been projected on the assumption of capacity utilisation of 90 per cent in respect of nitrogen and phosphatic fertilisers.

Total decontrol of fertiliser imports suggested

Total decontrol of fertiliser imports, phased rationalisation of feedstock costs and modifications to the retention price scheme (RPS) are among the major suggestions made by a confidential report presented to the parliamentary committee on fertiliser subsidies.

The report, based on a study commissioned by the Finance Ministry to analyse the impact of cutting subsidies on fertiliser offtake and foodgrains production, has already been cleared by **Dr. Manmohan Singh.** Final approval is now awaited from the parliamentary committee, which has postponed formulating its recommendations to the government on the issue following serious differences of perception amongst its members.

The report has been prepared by a group of economists at the National Council for Applied Economic Research under the supervision of **Dr. Ashok Gulati,** an expert in agricultural economy. According to the report, withdrawing the present import subsidies for di-ammonium phosphate (DAP) and potash and increasing administered prices of raw materials used for producing nitrogenous fertilisers in the country would result in a saving of over Rs. 2,500 crore.

It estimates that a 30 per cent increase in fertiliser prices this year would result in a seven to eight per cent hike foodgrains costs. The report says that the RPS should be retained but an upper ceiling fixed on prices payable to fertiliser manufacturers. It suggests that the last two years' moving average of costs of importing the same product at the market exchange rate, with an additional 10 per cent added to provide protection to domestic industry as the ceiling. The increase in prices of nitrogenous fertilisers says should be made without disturbing its present ratio to the prices of DAP and potash to encourage farmers to go in for mixed fertiliser application.

Nitrogenous fertilisers, which are largely produced domestically, account for over 60 per cent of the total fertiliser consumption in the country. The impact of increasing fertiliser prices in a phased manner, the report says, will not significantly decrease offtake by farmers. In fact, it points out that a subsequent hike in foodgrains prices and ensuring proper access to irrigation could balance any adverse fallout.

About the likely impact of the proposed measures on Indian industry, the report feels that hardly two per cent of existing units would be affected. The measures, it says, will also not disturb the overall foodgrains economy in the country greatly. Analysing other possible methods of reducing the government's fertiliser subsidy bill, the study estimates that rationalisation of feedstock prices all at one go would render 40 per cent of the domestic nitrogenous fertiliser manufacturers economically unviable.

Arguing that the present prices of natural gas, fuel oil and naphtha paid by industry are actually on the lower side compared to the government's costs of production and procurement, it says that the subsidy bill could come down by almost Rs. 700 crore through proper rationalisation. Such a move, the report estimates, would result in a hike in fertiliser prices by 60 per ceent. Under this scenario, it suggests that one way of offering protection to domestic industry from likely international competition could be by allowing import of nitrogenous fertilisers at market exchange rates only. In yet another scenario, where only the present subsidies for domestic production of nitrogenous fertilisers are removed, the report projects a 50% increase in fertiliser prices.

Core sector production shows mixed trend

The production performance of nine infrastructure sectors during 1991-92 showed mixed trends but the targets in petroleum, fertilisers and cement sectors could not be achieved with serious implications for the rest of the economy.

This has been revealed in a review of the production performance of the infrastructure sectors being monitored by the Department of Programme Implementation. It said overall targets for the year were exceeded in case of power, coal, steel (hot metal and saleable steel), railways (revenue traffic), shipping and telecommunications (production of switching equipment and provision of telephone connections in the monitored sector).

Within the power sector, coal-based thermal generation and atomic power generation showed significant shortfalls. In case of coal, the original target of 234 mt was reduced to 228 mt reportedly with the objective of reducing the high pithead stocks, the review said. The main issues emerging in the infrastructure sectors during 1991-92, according to the review, are:

Power:

(a) While the overall power generation exceeded the target by 1.1 per cent, in the Central sector the generation by atomic power plants feel 18.5 per cent short of the target for the year and was 10.6 per cent less than the generation achieved in 1990-91. The capacities of all the atomic power stations have been under-rated because of various technical reasons. Inadequate availability of heavy water and nuclear fuel added to their ills.

The contribution from these stations may not be significant in 1992-93 and also later, until these problems are solved. The review said availability of more power wagons per day will be required. The problem will become more acute in case of a poor monsoon during the year which would reduce hydrogeneration. Generation from this segment made substantial contribution to overall power scenario by exceeding the 1991-92 target by 11.8 per cent.

Coal

(a) Coal production met the target of 228 mt. Coking coal and washed coal production were higher in 1990-91 but could were higher in 1990-91 but could not reach the annual targets. The quality of coking coal had also been deteriorating progressively in terms of ash and moisture content resulting in continued imports of coking coal not only to meet the gaps but also to maintain the quality by blending with indigenous coking coal. (b) Coking coal demand is going to increase significantly in 1992-93 because of higher demand by Visakhapatnam Steel Plant and unless indigenous coking coal quality is maintained to the required level, more imports will have to be resorted to. (c) The year 1992-93 has started with a low stock position of coking coal which will need replenishment to maintain an optimum stock level.

Steel

(a) The production of hot metal as well as saleable steel surpassed their respective targets for 1991-92 but ingot steel production fell into two per cent below target. The available capacities installed in the integrated steel plants were not fully operated and the production from them had not been commensurate with the same. For 1992-93, the major production of steel products has still to come from SAIL's Bhilai and Bokaro plants, and VSP in the public sector. The results of modernisation of DSP will be available only after 1992-93 and of RSP only after 1995-96.

(b) Thus, in 1992-93, performance of these three plants must show good results. The infrastructural as well as technical constraints have forced a review of the installed capacities of the SAIL steel plants leading to annual targets being set at a level lower than their potential. The blocking of resources in the nature of unutilised capacities has to be corrected and production stepped up in accordance with the installed capacity by proper quality of inputs like coking coal, iron ore and limestone on the one hand and by reaching higher performance level of the existing facilities which have shown improvement.

(c) PLF in captive plants will have to be raised to reduce dependence of steel plants on power from SEBs and DVC.

Petroleum

(a) The deceleration in crude oil production from an all-time high of 34.09 mt in 1989-90 to 30.343 mt in 1991-92 has been basically because of fall in oil production from damaged wells of Bombay High (offshore) resulting in closing down of a number of wells and high gas-to-oil ratio which forced ONGC to reduce oil production for reducing production of associated gas.

Production in Assam area was low because of the law and order problem. The refinery throughput was also affected in keeping with this slowing down of crude production and cut back on imports owing to balance of payments (BoP) constraints.

Fertiliser

The public sector units of FCI and HFC are in the main responsible for the low capacity utilisation of public sector plants. The cooperative sector has demonstrated exceedingly high capacity utilisation in both the nitrogenous as well as phosphatic fertilisers production.

Cement

Production fell more than 1.5 mt from target on account of extremely poor performance of the state-level public enterprises in the cement sector. The abysmally low capacity utilisation at around 35 per cent is responsible for the slowing down of cement production causing an erratic movement in prices. The government had to intervene to control prices.

Incentives to save environment announced

Prime Minister **Mr. P.V. Narasimha Rao** has said that Environment Day is an occasion for us to reflect on what has been accomplished and also on what requires to be done. He said that it was an occasion when we must pledge to care for nature so that nature cares for us and the generations unborn.

In a message on the occasion of world environment day on June 5, Mr. Rao said the theme for this year's environment day "Only One Earth-Care And Share" is, indeed, very appropriate. "The Earth sustains us. Upon its bounties human progress. The global environment, its rich bio-diversity, as well as natural resources are in danger today of being irretrievably lost in the course of humankind's unthinking march to development and progress".

Mr. Rao said, "The challenge before us is to find a path of development, understand the true meaning of progress, which meets our requirements without endangering environment, without imperilling our very existence, a path of developmeent which is sustainable. The challenge is for every one on this earth to work together in a spirit of equity and cooperation towards this goal", he said.

Two awards instituted

The Ministry of Environment and Forests has introduced two new initiatives on the eve of World Environment Day. The ministry has announced an in-house incentive scheme for its scientists for outstanding scientific and technical achievements for furthering the objectives of the ministry.

Two awards have been instituted under the name 'Vishist Vygyanik Puraskar' and carry a certificate and cash prize of Rs. 20,000 each to be declared in November every year. The award will be conferred on scientists working in the ministry and who have made outstanding original contribution to the science of environment or any other objective of the ministry, said a release. In its mission to make environment a people's movement the ministry has recognised the need for involving non-governmental organisations in a big way.

CALL TO RESIST MOVE ON PATENTS BY FOREIGN COMPANIES

Dr. Suman Sahai, convenor of the 'Gene Campaign' has said that the Government must firmly reject moves by foreign companies to patent our plant varieties and genes. This highly unfair and dangerous demand, if accepted by the Government, would have very serious consequences for India, Dr. Sahai said, while participating in a meet-the-press programme, organised by the Rajasthan Working Journalists Union in Jaipur on June 1.

She said that in the Dunkel draft, the section relating to Trade Related Intellectual Property status (TRIPS) was very dangerous as it would 'finish' 75 per cent of the Indian farmers. Dr. Sahai said that India had already been penalised by the Americans under Special 301 because we did not give into their demand for patenting of plants, animals and other living organisms, which are not allowed under Indian laws.

She condemned the brazen attempt of Western powers to impose their patent laws on India and said, 'there can be absolutely no question that decisions with regard to India's policies, will be taken by the Indian policy makers'.

She said that Indian scientific research, particularly agricultural research, would be stifled by lack of access to patented genetic material. The task of breeding new and improved varieties of food and cash crops suited to Indian conditions would become increasingly difficult.

Notification on domestic sales by EOU's awaited

Sales in the domestic tariff area (DTA) by 100 per cent export-oriented units (EOUs) and those located in the export processing zones (EPZs) are held up as the Commerce Ministry has not issued a notification in terms of the new Exim policy.

Some development commissioners of these zones are understood to have enquired about the notification in the absence of which they cannot allow domestic sales by these units. On behalf of the EOUs, the ministry's attention has been drawn by the Confederation of Export Units (CEU). Since the notification has not yet been issued, units have been put into difficulties as they cannot effect domestic sales of their products which are permitted under the policy.

Even in the case of sale of 'rejects' up to five per cent, these units are at loggerheads with the customs authorities which, these units point out, take their own time in deciding such sales. CEU has suggested that chartered engineers, instead, be allowed to certify the 'rejects' to expedite the clearance. In any case, clearance of development commissioners has to be obtained before the sales could be made.

The Hand Book of Procedures (1992-97) issued on April 30 had stated that the detailed procedure for sale in the domestic tariff area by 100 per cent EOUs and those located in EPZs would be notified through a public notice. It is reliably learnt that the Commerce Ministry has not been able to decide on the procedure despite many discussions.

Officials are expected to take more time to finalise the procedure after which it could be notified by the Chief Controller of Imports and Exports (CCIE). While making a reference to the public notice, the relevant chapter in the Handbook states that if a unit manufactures several products, bunching of products for sale in DTA may be permitted subject to the condition that an individual item in a bunch is not allowed DTA sale entitlement in excess of 35% provided that total sale effected is within the limit of 25 per cent".

Where only 15% DTA sale is permitted, an individual item in a bunch may be sold up to 20% subject to the overall ceiling of 15%. DTA sale permission may be granted by the concerned development commissioner taking into account value addition achieved and production during the previous quarter year, depending on the period for which DTA permission is sought. Apparently, such units are not in a position to sell their production in the domestic market.

EXPORT, TRADING HOUSES:

Criteria for recognition may be changed

The Commerce Ministry is taking a fresh look at the hike in threshold limit for recognition to export, trading and star trading houses in a bid to push exports and strengthen their negotiating capacity with foreign clients.

In less than two years there has been a three-fold rise in the threshold limit for recognition as export house and trading house from Rs. 2 crore to Rs. 6 crore and from Rs. 10 crore to Rs. 30 crore respectively. Since this sector contributes nearly 60 per cent of the total exports, the government is keen to ensure that a high threshold limit does not render export houses ineligible as also reduce the status of existing trading houses and star trading houses.

The exporting community fears that if this happens, their export promotion efforts would be discouraged. Moreover, their negotiating strength with their overseas client will be reduced. Government recognition of the status of these professional exporting firms, it is argued, plays a very vital role in establishing their credentials in the international market. The overseas buyers are more receptive in dealing with exporters of standing.

There cannot be better identification for the latter than the recognition given by the government itself. If the hike in the threshold limit has been necessitated on account of devaluation of the rupee and introduction of partial convertibility, the benefit would accrue to the exporters on exports made after March 1, 1992. Exporters argue that the computation of net foreign exchange earnings (NFE) for recognition is based on the exports made in the three preceding years, and therefore higher value of exports in rupee terms will accrue onl from 1992-93 onwards. Therefore, the suggest that the government shoul reconsider its decision to raise the thres hold limit from Rs. 4 crore for expo houses for the time being in order t maintain their credibility in the inte national market.

Since the full benefit of LERM would be reflected now, the raising o threshold limit should be applicabl with effect from April 1, 1995 whic would account for the preceding thre years, 1992-93, 1993-94 and 1994-95 An option would be to have a transi tional period as was done in the 1990-9 Exim policy when the threshold limi was earlier raised for renewal of expor house certificate from year-to-year basi upon achievement of targeted exports

WBFC HIKES INTEREST ON ALL SCHEMES

The West Bengal Finance Corpora tion (WBFC) has hiked the interest rate on loans under all schemes. The ne rates have been put into effect. Addres sing a meeting of the Bengal Nationa Chamber of Commerce and Industry i Calcutta on June 5, the WBFC Manag ing Director, **Ms. Mira Pande** said tha the rates had to be hiked because th Small Industries Development Bank o India (SIDBI) and the Industrial Devel opment Bank of India (IDBI) had pro portionately hiked their refinance rates

Loans ranging from Rs. 7,500 to Rs 25,000 would be charged an interest rat of 17.5 per cent; for loans over Rs 25,000 to Rs. 2 lakh, the new rate woul be 19 per cent. Loans exceeding Rs. lakh for SSIs and RTOs would carry rate of 23 per cent and 24 per cen respectively. Loans to medium secto industrial units and other non-SSIs cov ered under IDBI's refinance would b charged interest at 24 per cent. Loan for working capital under the single window schemes would be charged 17 per cent for amounts between Rs. 7,5 and Rs. 25,000.

Bankers' consortium calls review meet on IDPL

The consortium of bankers to Indian Drugs and Pharmaceuticals Ltd. (IDPL), the ailing public sector company, has called an urgent meeting on June 21 to take stock of the situation following the reference of the company to the Board for Industrial and Financial Reconstruction (BIFR).

IDPL was formally referred to BIFR on May 25 last under Section 15 (1) of the Sick Industrial Companies (Special Provisions) Act, 1985 (SICA). Following this, inter-corporate loans worth crores of rupees made available to IDPL by several Public Sector Undertaking (PSUs) would remain locked up, till BIFR takes a final decision on the case.

As on January 31, 1992, the company had drawn from the consortium of banks, Rs. 37.35 crores in excess of its drawing power and Rs. 25.93 crores in excess of the sanctioned limit. These funds also will be locked up till a final settlement by the Board.

It is learnt that the consortium, led by the industrial finance branch of State Bank of India (New Delhi) is likely to ask for a Government guarantee on any further lendings to the company. The other members of the consortium are State Bank of Bikaner and Jaipur, Punjab National Bank, State Bank of Hyderabad and Indian Bank.

The major public sector undertakings to which IDPL owes funds include the Life Insurance Corporation of India (Rs. 12.05 crores), Rashtriya Chemicals and Fertilisers (Rs. 5.6 crores), National Fertilisers Ltd. (Rs. 15.82 crores), Oil India Ltd. (Rs. 2.08 crores) and the Oil and Natural Gas Commission (Rs. 5 crores).

IDPL has created a record of sorts by becoming the first drug company in India to cross the annual loss figure of Rs. 103 crores in 1991-92. This is against a share capital of Rs. 112.65 crores and the previous year's losses of Rs. 88.26 crores. The Government, had, in fact, made two efforts, one in 1972 and the second in 1978 to restructure the capital and afford certain reliefs like interest moratorium etc. Even after that the Centre and the nationalised banks together pumped in more than Rs. 60 crores in the last few years. IDPL's working capital was a record of Rs. 71 crores on April 1, 1990. But the losses in the last two years have eroded the working capital making it a minus Rs. 21 crores now.

The reference document submitted by the IDPL functional directors to BIFR in Form AA has placed a major portion of the blame for the company's sickness on the Government, particularly on 'the lack of purchase patronage for IDPL's formulations in the Government institutions.' This, they allege, was done after creating massive capacities in the company.

They have also blamed the Government for its policy on penicillin G distribution, the reverse discrimination by which the bulk drug producers in the private sector enjoy tariff protection while penicillin G, predominantly produced by the public sector units (IDPL and HAL) is allowed to be imported tariff-free. The total denial of non-Plan support to make up the cash losses of IDPL, 'while many other ailing PSUs have been given such support,' has also contributed to the current situation, they say.

Official explanations apart, it looks that one of the major causes of the losses incurred by the company was the huge wage bills. IDPL's wage bill of Rs. 63 crores represents more than 40 per cent of the production value against the industry average of 13 per cent. The present position is that the company, breaking the tradition of paying salaries on the first day of the month, has started staggering payments. The arrears of the company to IDPL Employees' Contributory Provident Fund, was of the order of Rs. 290 lakhs at the end of the last financial year. It has agreed with the Regional Provident Fund Commissioner to liquidate the arrears in instalments.

IDPL has also defaulted to the Cenral Industrial Security Force to the extent of Rs. 364 lakhs. The Director General of CISF has already given notice that the forces would be withdrawn from the Rishikesh and Gurgaon units of the company soon.

Indian Oil Corporation and Hindustan Organics Ltd. who supplied furnace oil, important chemicals and drug intermediates to IDPL have also their money blocked to the extent of Rs. 400 lakhs and Rs. 500 lakhs respectively.

The company seems to be still in the process of finalising a programme which would turn it around in a reasonable time period by wiping out losses and scheduling settlement of past debts.

COROMANDEL FERTILISERS

Coromandel Fertilisers Ltd. has recommended a final dividend of 10 per cent for the year to March 1992. With the interim of 10 per cent, the company has paid a total of 20 per cent against 23 per cent paid last year.

The gross profit before depreciation and taxation was Rs. 2,218 lakhs (Rs. 1,191 lakhs). Depreciation claims Rs. 408 lakhs (Rs. 327 lakhs) and the net profit stood at Rs. 1,810 lakhs (Rs. 864 lakhs).

The profit on sale of cement undertaking is nil (Rs. 3,629 lakhs). Taxation takes Rs. 860 lakhs (Rs. 1,100 lakhs) and transfer to general reserve Rs. 500 lakhs (Rs. 2,000 lakhs). The balance amount retained in profit and loss account is Rs. 1,102 lakhs (Rs. 1,091 lakhs).

Scheme to woo NRI scientists

The government has set up a bureau that will bring non-resident Indian (NRI) scientists and technologists in contact with Indian industries which in turn would benefit from the expertise of the NRIs. An estimated 375,000 highly qualified scientists of Indian origin are working overseas, most of them still having roots in their homeland.

The bureau, officially known as the Interface for NRI Scientists and Technologists (INRIST), expects to lure some of the drained brains with offer of short-term assignments in industries and prospects of joint-venture in high technology areas. Response to this dating service both from NRIs and Indian firms has been excellent, according to **Dr. S, Majumdar,** Director of INRIST who says INRIST has been flooded with requests for NRIs especially from food processing and jute industries. Demand for NRIs has also come from drug and computer companies, big corporate research centres in private and public sector and the automobile industry. INRIST's directories giving details of potential NRI recruits have been distributed to 800 parties.

Dr. Majumdar says supply of NRIs, eager to contribute to India's industrial development, is outstripping demand. INRIST data base covers 20,000 NRIs and is growing. Handbooks explaining work vistas and goverment's liberalised rules for joint venture have been distributed to NRI associations abroad and prospective recruits, if necessary, will be directly interviewed by INRIST.

The government expects to attract more NRI's through INRIST than what was accomplished under the UNDP-aided project called Tokten, an acronym for transfer of knowledge through expatriate nationals.

In the last decade only 330 NRI accepted Tokten consultancies in thei homeland. In contrast China was abl to attract 150 expatriates every yea Lack of communication between gov ernment departments and absence of dedicated agency to liaise with NRI and their host organisations hampere the Tokten project.

INDIA, US TIE-UPS TO INCREASE TECHNOLOGY FLOW

Technology and investment flow into India can be augmented throug tie-ups between small businesses i India and the United States of America This was the principle observation of a delegation of small and medium industry representatives from the Confederation of Indian Industry (CII) after it visit to the US.

The delegation's mission was supported by the US Small Busines Administration (US SBA). According t the leader of the delegation, **Mr. S.B. Shah,** a large number of US companie made detailed presentations on technologies on offer as well as the procedure for transfer of technology.

The delegation observed that an important aspect of the developmenta process for US small business was th technology transfer arrangement between the US small industry, institutions and government.

According to CII, the US has unique international programme fo overseas firms to sell their products i the US and to increase business con tracts and cooperation between oversea and American firms.

The CII delegation said that despit issues such as intellectual propert rights, there was an across the boar appreciation of the Indian reform pro gramme. Many large US corporation and small businesses were willing t share technology and discuss busines

4000 MW super thermal complex proposed for Orissa

An ambitious proposal to scrap the Kayamkulam and Mangalore power units in Kerala and Karnataka respectively and substituting them with a massive 4000 MW super thermal power complex in Orissa to feed the power-starved Southern grid has been mooted by the National Thermal Power Corporation (NTPC) and is being discussed by the Union Power Ministry.

The project is contemplated as a pit-head station to be set up in the coal-rich Ib valley of Orissa. The complex is being slotted as a "National power project" for electricity to be drawn out of the state. The power is proposed to be ferried efficiently across hundreds of miles through hi-tech 400 Kva high-voltage direct current (HDVC) electricity lines.

NTPC sources are already in touch with the Orissa Chief Minister, **Mr. Biju Patnaik.** It is not yet known whether Mr. Patnaik has evinced interest in the proposal. Mr. Patnaik has already tied up with a multinational for a super thermal unit in the valley. But the agreement is reported to be coming unstuck and NTPC wants to step in.

This does not mean that NTPC will step in, because the wily Oriya CM is quite capable of pushing for a private instead of a public sector participation once again. There will be no shortage of private offers for, afterall, Ib valley is an ideal site for a money spinning super thermal power station.

Quite clearly, if the Ib valley project is set up at the cost of the Kayamkulam and Mangalore units, strong state-level political opposition is expected to crop up and NTPC or the Power Ministry may find it difficult to steer such an idea through the Cabinet Committee on Economic Affairs (CCEA). Power Ministry sources, however, admit that the proposal is at a very preliminary stage. The Ib valley project has been mooted because the fate of the Kayamkulam and Mangalore power projects has become uncertain after Russia has refused to honour earlier assistance programmes for the two projects. The erstwhile Soviet Union in September, 1989 had agreed for a 600 million-rouble credit line to finance the two projects and also the Maithon right bank project in Bihar.

The two Southern projects, according to earlier estimates, were to cost Rs. 1,000 crores apiece. Russia is now insisting on fresh terms for both the projects. The units are also running into environmental problems.

The argument advanced by NTPC in favour of having a large pithead unit in Orissa is that ferrying electricity to the Southern states will be cheaper than carrying coal to these regions. The two Southern units were being set up at coastal sites to enable coal to be supplied from the Talcher mines through the Paradeep port.

Further, it is claimed that efficient HDVC lines will mean minimal transmission losses. Another advantage with the so-called 'national power project' will be that, if required, it can also send power to the Eastern grid.

Sources claim that it political opposition mounts for the Kayamkulam and Mangalore projects, then it is quite likely that the Centre will go ahead with the first phases — setting up 420 MW units each. But plans to raise the capacities to 1210 MW each may be stalled until the Ib valley project comes up.

REORIENT POLICIES, OIL INDUSTRY TOLD

The Government has asked the public sector undertakings in the oil industry to reorient their policies and implementation of other projects in line with the new economic policy. Addressing a meeting of the chief executives of public sector oil companies in the refining sector in New Delhi on June 5, Petroleum Minister **Mr. B.Shankaranand** underlined the need for these units to adapt themselves to the changing economic and industrial environment of the country.

He said the oil industry has to reorient its strategies to meet the new challenges emerging out the recent developments following liberalisation of the economy. Future growth and development of the industry would depend on its ability to keep pace with and adjust to these changes, he said.

The Minister also discussed various issues involved with the expansion of refining sector in the light of the new economic liberalisation and asked the chief executives of the public sector units to prepare a plan of action within one month to meet the managerial, financial and technical challenges that the oil industry has to face in the changed circumstances.

Mr. Shankaranand expressed concern about the instance of cross movement of petroleum products particularly of LPG and suggested that such movement should be eliminated by reorganising the transportation network.

PLAN TO RAISE VANILLA FARMS

The Spices Board plans to raise Vanilla plants on a large scale in Lakshadweep, Kerala, Karnataka and Tamil Nadu with an eye on exports as the high value vanilla essence from the plants fetches a price of \$84 a kilo in the international market.

The Spices Board sources said this was decided after a successful test planting in the board's research institute in Myladumpara in high range Idukki district in Kerala.

Power cut in UP may be relaxed

The four-hour power cut imposed on industrial units in Uttar Pradesh in view of non-availability of adequate power may be removed for some industries due to strong opposition by entrepreneurs in different categories.

A proposal to exempt export-oriented units from the cut is already under "active consideration" of the government. The state has to import power varying from 400 MW to 500 MW per day to meet the rising demand for power.

Industrialists are feeling the pinch of the cut — from 6 pm to 10 pm — more because they have to bear the burden in addition to steep increase in power tariff effected this year to mop up an additional revenue of over Rs. 450 crores.

The government has provided some concessions to industrial units using induction furnaces and others but these reliefs are not being considered "adequate" by these units.

"What has been offered to us as a relief is just chicken-feed. Our production cost has risen abnormally due to the increase in power rates," said an entrepreneur who would not like to be named.

Further reliefs may not be possible immediately for Uttar Pradesh State Electricity Board (UPSEB) is in a bad shape financially and is overburdened with debts. Import bills are rising every day because of fall in power generation by its own units, adding to its financial burden.

One of the constraints that it faces is lower collection of revenue. State government undertakings have mounting power dues, making the board's position more vulnerable.

They can hope to clear the dues only with the government's assistance which is not forthcoming because the latter too is beset with financial constraints. Power dues, upto November last, had exceeded Rs. 924 crores out of which over 20 per cent were owed by the state undertakings. 'Jal Sansthan', Kanpur, topped the list with arrears totalling Rs. 17 crores which was followed by UP Cement Corporation which had unpaid dues of the order of Rs. 15 crores.

Private industries too owed a considerable amount to the board. The additional problem that UPSEB faces is that some of these units have disputed the power bills and gone to the court. These dues are unlikely to be cleared without fighting a legal battle which is both time consuming and costly.

Among the industrial houses which have disputed the claims are the Birlas (Hindalco), Kanorias and the Modis. One of the pleas they have made is that certain concessions which were granted to them have not been taken into account while computing the bills.

URANIUM OUTPUT CUT MAY HIT N-PLAN

The country's progress in the nuclear field may slow down during the Eighth Five-Year Plan following a drastic cut in the production of uranium by the Department of Atomic Energy.

Uranium Corporation of India Ltd. chairman-cum-managing director **Mr. J.L. Bhasin** said in Jamshedpur recently that paucity of funds had led to the cut in the production of uranium and that only Rs. 250 crores had been allocated for the Narawa and Turamdih projects whereas their requirement was Rs. 500 crores.

He said that the projects were abandoned after spending Rs. 40 crores and added that the uranium mines at Turamdih were capable of producing about 3,000 tonnes uranium per day. Mr. Bhasin said that the Atomic Energy Department, after reviewing the Turamdih project recently which was sanctioned in 1986, had declared it 'uneconomical'. 'It is not only the financial crunch, but also the high operating cost, labour and local problems that had forced the project to be abandoned after such huge investment,'' he added.

The UCIL's Jadugora unit would have topped in the uranium production if the Turamdih project was implemented, he said and informed that the Narawa project, with a capacity of 1,500 tonnes per day, would be completed by June 1995. The atomic energy department had cleared the expansion of the Jadugora unit up to 1,000 tonnes per day.

He said that uranium ore and mill expansion area for extracting uranium would also be increased proportionally.

IFC TO FUND SPONGE IRON PLANT

A sponge iron plant with a capacity of one million tonne per annum will be set up on a greenfield site South of Bombay at an approximate cost of Rs. 650 crores.

The International Finance Corporation (IFC) — an affiliate of the World Bank — will provide 20 per cent of the projects total cost.

IFC's investment includes a $40 million loan, which will help to cover the project's foreign currency needs and an equity investment of approximately $5.74 million.

The project, to be set up by Nippon Denro Ispat Limited (NDIL) will make use of locally available gas and iron ore. The sponge iron will be briquetted and sold to mini steel mills as a substitute for imports of steel scrap, a press release issued by IFC said at New Delhi on June 4.

SAIL, RINL surpass production targets

The steel sector's performance during 1991-92 has been satisfactory as both Steel Authority India Limited (SAIL) and Rashtriya Ispat Nigam Limited (RNIL) surpassed the targeted production of hot metal, crude steel, saleable steel and pig iron.

Steel Ministry sources said that financial performance of the other public sector undertakings under the administrative control of the ministry was also highly satisfactory. SAIL officials, when contacted, said that the company had achieved 10 million tonnes mark for the first time in hot metal production for the year ended March 31, 1991.

A senior SAIL official, requesting anonymity, reacting to the programme implementation ministry's views on not achieving targeted steel ingot production, stated that this was not the true position. He said that both SAIL and RINL, which runs Visakhapatnam Steel Plant (VSP), had to produce more pig iron in view of the acute shortage of the product. He said that SAIL produced 9.6 million tonnes of crude steel (steel ingot) against the target of 9.8 million tonnes which was barely 2 per cent lower than the target.

The official further stated that the performance had to be judged after considering the constraints faced by the company. He was of the view that if more steel ingots were to be produced, then pig iron production would have suffered and it had to be imported to bridge the demand and supply gap.

He said that quality of coal being supplied by Coal India Limited continued to cause concern and had direct bearing on the production performance. Further, erratic power supply and constraints faced by the steel mills in procuring railway wagons also affected the performance.

Steel ministry officials also shared the SAIL view and stated that the company had not raised its prices since September, 1990 and still had managed to post a net profit of Rs. 280 crores as against the target of Rs. 133 crores. They said that SAIL had managed to break the summer syndrom last year resulting in higher production. The company had produced 8.45 lakh tonnes of pig iron as against the targeted production of 7.9 lakh tonnes.

Ministry officials stated that SAIL had been asked to keep a check on energy consumption rate and its blast furnace capacity had improved considerably. According to them, even IISCO had recorded a modest profit for the year ended March, 1991. Referring to VSP, they said that the plant had produced 1.24 million tonnes of hot metal as against the target of 1.3 million tonnes. The actual production was achieved in nine months' working. The commissioning of the plant is also way ahead of its targeted schedule, they maintained.

National Mineral Development Corporation (NMDC) and Kudremukh Iron Ore Limited (KIOL) have also achieved 250 per cent growth in their profitability. NMDC is likely to declare net profit of over Rs. 140 crores whereas KIOL's net profit is in the region of Rs. 130 crores.

BIRLAS LIKELY TO SET UP STEEL PLANT AT HALDIA

The West Bengal Chief Minister and minister-in-charge of Commerce and Industries Department, **Mr. Jyoti Basu,** said at Calcutta on June 4, that a memorandum of understanding (MoU) might be reached with a Birla Company for the setting up of a steel plant at Haldia.

Replying to the debate in the state assembly on the budget demand for his department, Mr. Basu said that the discussions were in progress with the Birlas about the supply of coking coal for the proposed project in the joi sector at an estimate cost of Rs. 50 crores to Rs. 600 crores.

HPL progressing well

Amidst repeated demands from th Congress (I) Opposition to inform th House about the possible date of com missioning of the Haldia Petrochemical Ltd., Mr. Basu announced that "th work on the implementation of HPL i progressing well and will be com pleted."

Mr. Basu informed the House that th HPL was negotiating with various insti tutions and agencies for trying up for eign exchange component to the tune o about Rs. 650 crores. The negotiatio with Mr. Ratan Tata would be held soo to help complete the Haldia projec expeditiously, according to Mr. Basu

Meanwhile, the original cost of th project i.e., Rs. 700 crores had bee escalated to Rs. 3,000 crores and furthe to Rs. 4,500 crores due to the recen rupee devaluation.

Following the changes in the trad policies, the Union government wante to peg it within Rs. 3,000 crores, h said, adding that the company had com out with a revised scheme to ensure th viability of the project without affect ing the product-mix and the basic inte grity of the complex.

DAVY POWER BAGS CONTRACT

Davy Powergas India has bagged contract to design and construct coppe smelter for Sterlite Industries Ltd. (SIL) The contract for 60,000 tonnes a yea smelter was signed at New Delhi o June 1. The outlay for SIL complex i estimated at over Rs. 600 crores an copper smelter project is expected to b scheduled by the end of 1994.

Apart from constructing smelte Davy Powergas will also provide th overall project management service according to a press release.

Stress on reorienting mineral exploration strategy

The mineral exploration strategy has to be reorganised with special emphasis on those minerals for which resources are poor. This step was necessary due to the increasing gap between demand and supply of most minerals. This gap was expected to widen further in the coming years.

A greater thrust need to be given to mineral exploration activities considering the time lag between discovery and mineral production, according to the Eighth Plan document. There was a need for the adoption of improved technology including remote sensing and geophysical techniques.

The Plan document said that the State sector's contribution in mining of industrial and non-metallic minerals was quite significant. Reorganisation and strengthening of the State Government departments concerned would be accorded priority in the Eighth Plan. The iron ore constitutes one of the major exports if the country with a foreign exchange earning of about Rs. 1,200 to Rs. 1,300 crores during 1991-92.

The document said that the major exporters are the National Mineral Development Corporation (NMDC), Kudremukh Iron Ore Company Ltd. (KIOCL) and private parties, particularly the goan mine owners.

The iron ore from the Bailadilla mines of NMDC was by far the richest in the country and until recently, the entire Bailadilla output was being exported, with the indigenous industry using inferior grades. Thus it was imperative to reduce the level of exports of very high grade iron ore and utilise it increasingly in indigenous steel plants, particularly for direct reduction.

As a significant proportion of iron ore reserves was in the form of blue dust, greater efforts would have to be made for their utilisation for which necessary research and development work would be taken up. In this context, NMDC would undertake a project in collaboration with the Department of Electronics for the manufacture of various types of ferrite powders using indigenous raw materials and blue dust.

During the Seventh Plan, expansion of Bokaro and Bhilai steel plants to a four million tonnes capacity each, modernisation and expansion of the Tata Iron and Steel Company (TISCO) and the first phase facilities of Visakhapatnam Steel Plant were completed.

In addition, there has been an impressive growth of production capacity in Mindi steel plants and induction furnace units in the secondary sector. The second phase of the Visakhapatnam Steel Plant was expected to be completed in August this year, it said. The Indian steel industry had been suffering from a number of disabilities. Obsolescence of machinery and technology had been an important factor responsible for low capacity utilisation, low productivity, high energy consumption and high production cost, it said. It said that in the sixties, the Indian steel industry was internationally competitive, but it was no longer so.

The programme of development of the steel industry in the Eighth Plan was aimed at improving the technological health of the existing integrated steel plants and modernisation and upgradation of technology so as to achieve international competitiveness in respect of both cost and quality, the Plan document said.

The modernisation of the existing integrated steel plants at Durgapur and Rourkela in the public sector and TISCO in the private sector was expected to be completed in the Eighth Plan period.

The document said that the upgrada- tion of steel making in the secondar sector has been taken up during the cu rent five year plan and it was likely t be completed during the Eighth Pla period itself.

All these measures initiated in th Seventh Plan would bring the India steel industry at par with global stan dards. The scrapping and rebuilding Indian Iron and Steel Company (IISCO plant at Burnpur was also expected be taken up during the Eighth Pla period.

Under the recent policy changes, licence was required to set up iron ar steel units. These policy changes a expected to give an impetus to the cou try's steel industry to grow freely a also attract private investment. The in tial response of the private sector these changes appeared to be encoura ing, it said.

BIDDERS MAKE ON-THE-SPOT STUDY OF IISCO

Indian Iron and Steel Compa (IISCO), a subsidiary of Steel Auth rity of India Ltd. (SAIL),is on the th shold of being privatised, according sources. Three contenders from Calcu had visited IISCO to make on-the-sp study of the Burnpur, Kulti, Chasn and Gua works, the sources said. Th would submit their report to the Cen by June 11. The three bidders had be shortlisted by the State Bank of In capital markets.

Meanwhile, all the five trade uni of IISCO — CITU, INTUC, AITU BMS and HMS — have resented government's move to privatise IISC IISCO was taken over by the gove ment from private owners on July 1972, and was subsequently natio lised by making it a subsidiary of SA After being in the red for as man 18 years, IISCO earned a profit of R crore in 1991-92 and is poised to a profit of Rs. 25 crore in 1992-9

Spotlight on Biotechnology and Life Sciences

MCGENE OFFERS KEY TO CANCER

Searching amid the twisted wreckage of chromosomes found at the heart of nearly all human cancer cells, scientists have identified a handful of molecular aberrations that seem to be, not incidental debris that comes with malignant transformation, but the fundamental defects that helped spawn the cancer in the first place.

Among the most dangerous and widespread mutations they have found is one that disrupts a gene with the deceptively folksy name of MYC, pronounced "mick". Whether in tumours of the breast, brain, bladder, blood, lung, colon or other body parts. MYC has been seen skulking about in a state of frightening disrepair.

The gene is so frequently disturbed in cancer tissue, and in its normal guise it bears so many trademarks of being critical to the life and upkeep of all body cells, that researchers cannot help but call it McGene: everywhere they look there it is, the MYC gene.

Now, after nearly two decades of alternately dabbling with the gene and then abandoning it as too hard to decipher, researchers have made a series of breakthrough discoveries that are bringing this extremely important molecule into focus. Many of the results are basic revelations about how a cell knows when to divide, when to mature, and on occasion, when to commit suicide for the good of the body.

In a study published in the journal *Cancer Research*, scientists from The Netherlands said that women whose breast cancer cells harboured an abnormally high number of MYC genes, a type of mutation called gene amplifications, were far more likely to suffer a recurrence after surgery than women whose malignancies lacked signs of aberrant MYC amplication.

Test-tube and mouse experiments also suggest that of the many genetic flaws in the average cancer cell, the MYC defect is so nasty that its elimination alone may be enough to cure or at least tame a substantial fraction of tumours.

Using medications that have been around since the 1960s, Dr. Geoffrey M. Wahl of the Salk Institute in La Jolla, California, and Dr. Daniel D. Von Hoff of the University of Texas health science center in San Antonio have managed to correct MYC defects in cultured cancer cells.

The drugs work by encouraging the cells to eject their excess copies of the gene, and once those previously amplified genes are eliminated, the cells revert to a seemingly non-cancerous state.

The researchers are now exploring whether this approach has any medical value.

They have begun clinical trials for the treatment of advanced ovarian cancer through the use of a drug called hydroxyurea, which combats abnormal gene amplifications.

Women will be selected for the study if conventional therapies do not help them and if their tumor cells display signs of MYC amplification.

Scientists have learned many revealing details about what the protein produced by the gene normally does in the cell and why disrupting that housekeeping task can have such disastrous consequences.

They suspect that the MYC protein is a kind of toggle switch, sitting at the junction of two options an active cell must choose between: to proliferate with aerobic vigor, or to differentiate into a more sedentary state, as a mature member of the lung.

The MYC protein seems to be necessary to a cell to begin dividing and to keep dividing. (*New York Times Service*).

GENETIC DEFECT FOR FORM OF MUSCULAR DYSTROPHY IDENTIFIED

In one of the first tangible fruits of the Human Genome Project, an international team of researchers has identified the genetic defect linked with myotonic dystrophy, the most common form of muscular dystrophy. The discovery marks an important advance in understanding the cause of myotonic dystrophy, which affects at least one in 7500 adults workwide. The work, published recently in three consecutive papers in *Nature* [**355,** 545, 547, and 548 (1992)], could pave the way for treatments for the disease, as well as improved methods for its diagnosis. The pricipal investigators involved in the collaboration are all geneticists or molecular geneticists. They include Duncan J. Shaw and Peter S. Harper of the University of Wales College of Medicine, Cardiff; Keith Johnson of Charing Cross and Westminster Medical School, London; Pieter J. de Jong of the Human Genome Center at Lawrence Livermore National Laboratory, Livermore, Calif.; Robert G. Korneluk of the University of Ottawa, Canada; and be Wieringa of the University of Nijmegen, the Netherlands. The researchers found that individuals with myotonic dystrophy have a longer-than-usual sequence of repeating base

pairs at a specific site on chromosome 19. The length of the sequence appears to be directly correlated with the severity of the disease, de Jong says. The new findings, he adds, may permit the detection of nearly all cases before onset of the disease. (*C & EN* 10 February 1992)

METABOLISM OF ANTICANCER DRUG TAXOL TO BE STUDIED

The National Cancer Institute has awarded a three-year, $211,000 grant for a study on how the anticancer drug taxol, is metabolized in the body. The grant will allow natural products chemist Monroe E. Wall and coworkers at Research Triangle Institute in Research Triangle Park, N.C., to team up with oncologist Eric K. Rowinsky's group at Johns Hopkins University to study the problem. Wall and his RTI colleague M.C. Wani discovered taxol in 1963 when they isolated it from the Pacific yew tree, *Taxus brevifolia*, and noted its activity against a broad range of rodent tumors [*C&EN*, Sept. 2, 1991, page 11]. Rowinsky has been using taxol to treat advanced cases of ovarian cancer. The RTI chemists are currently developing methodology to detect taxol in body fluids at levels of 0.1 ppm or less. Rowinsky is providing the RTI team with samples of blood plasma, urine, and bile from cancer patients being treated with taxol. By analyzing these samples, the researchers hope to determine how long it takes for taxol to be metabolized and eliminated from the body. They also plan to purify and separate taxol's metabolites, determine their structures, and test them for antitumor activity. "By learning more about the metabolism of taxol," says Wall, "we'll be able to determine the safest and most effective way to administer it." (*C & EN* 10 February 1992).

DNA ANALOG BASED ON PEPTIDE BACKBONE

A team of Danish chemists has synthesized and characterized the binding properties of what it calls peptide nucleic acids — analogs of DNA in which the familiar bases of DNA (adenine, guaine, thymine, and cytosine) are attached to an achiral peptide backbone rather than to a deoxyribose phosphate backbone [*J. Am. Chem. Soc.*, **114**, 1895 (1992)]. Michael Egholm and Ole Buchardt, of the H.C. Orsted Institute at the University of Copenhagen, working in collaboration with Peter E. Nielsen, of the Panum Institute, Copenhagen, and Rolf H. Berg, of the Riso National Laboratory, Roskilde, Denmark, used computer modeling to determine that a peptide nucleic acid (PNA) consisting of a backbone made up of (2-aminoethyl) glycine units with bases attached via methylene carbonyl linkers would have a structure similar to DNA. They synthesized a number of single-stranded PNAs of varying lengths, and found that they bind to complementary single-stranded DNA. As expected, binding strength is proportional to the length of the PNA/DNA hybrid, and base mismatches result in weaker binding. Oligonucleotides that specially recognize messenger RNA or duplex DNA may be useful for inhibiting protein synthesis and modulating gene expression. Chemists have developed a variety of methods to increase the stability of the deoxyribose phosphate backbone of oligonucleotides in anticipation of its in vivo use. PNAs, the Danish chemists suggest offer another approach to such reagents. (*C & EN 9 March 1992)*

STRUCTURE DETERMINED FOR IMMUNOSUPPRESSANT

The structure of the immunosuppressant drug cyclosporin-A bound to an antibody fragment has been determined by scientists at the Institute of Molecular & Cellular Biology, Strasbourg, France [*Science*, **256**, 92 (1992)]. The structure is the same as that of the drug when bound to its natural binding protein, cyclophilin, and different from the structure of unbound cyclosporin A. Yet the modes by which the drug binds to the antibody fragment and to cyclophilin are known to be different. Thus, bio logist Daniele Altschuh and crystallo graphers Olivier Vix, Bernard Rees, an Jean-Claude Thierry conclude cyclospo rin A does not change its conformatio on binding to cyclophilin. They furthe suggest that the immunosuppressan activity of cyclosporin A is related t inhibiting the ability of cyclophilin t change conformations of peptides (rot amase activity). (*C & EN* 6 Apri 1992).

PROTEINS UNDER GLASS SHOW PROMISE AS OPTICAL SENSOR

Researchers at the University of California, Los Angeles, have encapsulate proteins in transparent, porous silicat glasses and have shown that the trappe biomolecules, retain their characteristi reactivities and spectroscopic propertie [*Science*, **255**, 1113 (1992)]. "The prospects are excellent," they say, for usin these protein-glass composites in opti cally based molecular sensors — a goa they are pursuing. The protein mole cules remain active because the glas matrix forms around them under mild aqueous conditions at room temperatur — features of the well-known sol-ge process. Proteins were first immobilize inside the pores of sol-gel glasses b David Avnir's group at the Hebrew University of Jerusalem. But those glasses generally have not been suitable for use in optically based sensors because they are opaque, notes the UCLA team, which was led by professors Bruce Dunn, Joan Selverstone Valentine, and Jeffrey I. Zink. The procedure they devised provides a glass matrix that is protein-friendly as well a being transparent. Although the protei is trapped inside the pores of the glass small molecules can readily diffuse int the pores and react with the protein. Th UCLA workers follow such reaction by monitoring changes in the visibl absorption spectrum of the protei Avnir, however, claims the UCLA wor is not novel. His group, he tells C&EN has worked for years with transpare sol-gel glasses and more recently ha

trapped proteins inside them. But based on what has already appeared in the literature, Zink sticks to his group's claim of doing it first. (*C & EN* 2 March 1992).

TUMOR PROGRESSION LINKED TO GENE MUTATION

Selective growth of cells containing mutations in a gene that encodes a tumor suppressor is responsible for the growth and increase in malignancy of brain tumors, according to Bert Vogelstein and coworkers at Johns Hopkins University's School of Medicine [*Nature*, **355,** 846 (1992)]. Vogelsstein's group, working in collaboration with researchers at three other institutions showed that the progression of non-invasive brain tumors (astrocytomas) to highly malignant brain tumors (glioblastomas) was associated with mutations in what is known as the p 53 gene. This gene, which encodes a tumor suppressor, is thought to act as a cellular "policeman," preventing anarchic growth by checking the activities of potentially cancer-causing oncogenes. Almost all glioblastoma cells contain p. 53 mutations, the researchers find. The same p. 53 mutations, however, is also present in a small number of astrocytoma cells. Tumors do not start out malignant, the researchers explain, but evolve from relatively benign, non-invasive growths. This work suggests "the progression of brain tumors is associated with a clonal expansion of cells that had previously acquired a mutation in the p. 53 gene, endowing them with a selective growth advantage" over other tumor cells, the scientists say. (*C & EN* 2 March 1992).

NEW TYPE OF ANTIBODY CAN BIND TWO ANTIGEN MOLECULES

Dimeric antibody fragments that are bivalent (able to bind two antigen molecules) and capable of being produced in *Escherichia coli* have been developed by Peter and Andreas Pluckthun of the University of Munich, Martinsride, Germany [*Biochemistry*, **31,** 1579 (1992)]. The researchers call them "mini-antibodies" because of their small size relative to native antibodies. Recombinant Fv (variable) fragments and larger Fab (antigen-binding) fragments have been produced previously in *E. coli* and shown to bind antigen effectively, but all such fragments have been monovalent, able to bind ne antigen molecule only. Construction of a mini-antibody starts with a single-chain Fv antibody fragment—one light-and one heavy-chain variable domain linked together co-valently. To the Fv fragment is appended a "hinge" sequence, which adds conformational flexibility; an amphiphilic helix, which induces dimerization; and an optional hydrophilic tail containing cysteine, which forms a disulfide bond upon dimerization. The fragments are produced by recombinant techniques in *E. coli*. Bivalent binding by mini-antibodies results in substantially stronger complexes than binding monovalent fragments. Mini-antibodies presumably could also be designed to bind two different antigens at the same time. Such heterobifuntional antibodies could be useful in cancer therapy—for example, by combining affinity for a tomor marker with the ability to bind an immune-system cell likely to attack the tumor. (*C & EN* 2 March 1992)

RESEARCHERS IDENTIFY 2375 HUMAN BRAIN GENES

As many as 5% of the genes in the human genome may now have been identified with what are known as "expressed sequence tags" (ESTs) by a team of researchers at the National Institute of Neurological Disorders & Stroke (NINDS), Bethesda, Md., led by J. Craig Venter [*Nature*, **355,** 636 (1992)]. Venter's team partially sequences complementary DNA (cDNA) produced by the reverse transcription of messenger RNA isolated from human brain tissue. Only about 3% of genomic DNA actually encodes proteins; the remainder consists of regulatory elements and a great deal of material whose function is unknown. In contrast, by definition, the cDNA clones sequenced by the NINDS researchers encode proteins. The scientists sequence about 400 nucleotides of each cDNA clone. This sequence represents the EST, which contain enough information to enable comparisons with known genes. Venter's group reports that 217 of the 2375 newly identified ESTs identify genes that encode proteins related to a variety of known human and non-human proteins. Coupled with previous research by the Venter team, ESTs for more than 2500 human genes have now been sequenced. The human genome is thought to contain between 50,000 and 100,000 genes. (*C & EN* 17 February 1992).

STM DISTINGUISHES CERTAIN DNA BASES

Scanning tunneling microscopy (STM) has been used for the first time to distinguish between adenine and thymine, two of the four bases of DNA. The work is a key step toward the ultimate goal of being able to sequence DNA by direct STM visualization of bases in complete DNA strands, perhaps in conjunction with spectroscopy. A paper describing the study, written by Rod Balhorn of Lawrence Livermore Laboratory and coworkers there and at Stanford University School of Medicine, is soon to be published in *Scanning Microscopy* [5, 625 (1991)], but is backdated 1991. Although STM has been used before to obtain images revealing the major and minor grooves of DNA, sufficient resolution was not available to idenfify individual bases. Now Balhorn and coworkers have done this, although not with natural DNA, but with bases dissolved in distilled water and laid out on a heated graphite surface. "The adenine and thymine molecules stick to the graphite surface and form a crystal lattice that is easy to work with," says Balhorn. "Because ... thymine contains a single hexagonal ring and the adenine molecule has a double ring structure, we can tell them apart." (*C & EN* 17 February 1992)

IMMOBILIZED ENZYMES DENITRIFY GROUNDWATER

An electrochemical-enzymatic process for removing nitrate from groundwater has been developed by S. Dickman Mobitec GmbH, Gottingen, Germany and at Michigan Technological University, Houghton, Mich. [*Nature*, **355**, 717 (1992)]. Nitrate pollution of ground water is a health hazard, but current methods for removing nitrates are either ineffective or impractical. For example, processes that use live microorganisms to denitrify water are slow, frequently incomplete, and difficult to set up and maintain. Now, Diekmann and coworkers find that enzymes isolated from denitrifying bacteria can do the job very nicely. In their technique, a series of oxidoreductase enzymes are coimmobilized in a polymer matrix, along with an electron donor species. The redox process, which is driven by an electric current, results in complete conversion of nitrate to gaseous nitrogen. "In principle," the researchers say, "such electro-bioreactors could be developed for removal of other water contaminants such as pesticides, if appropriate enzymes and cofactors can be identified." (*C & EN*, Feb. 24, 1992).

INCREASED UV UNDER OZONE HOLE HURTS PHYTO-PLANKTON

Increased levels of biologically damaging ultraviolet radiation penetrate the ocean surface under the Antarctic ozone hole and inhibit photosynthesis by phytoplankton, according to a new report by R.C. Smith of the University of California, Santa Barbara and co-workers [*Science*, **255**, 952, (1992)]. The researchers spent six weeks in September, October and November 1990 sampling the waters surrounding Antarctica, both directly under and outside the ozone hole. They used a new instrument to determine the penetration of UV radiation into the water and to measure its effect on phytoplankton biology. The growth of some types of phytoplankton was much more affected than others, they observed. They estimate the severe ozone depletion under the Antarctic hole caused a 6 to 12% reduction in photosynthetic productivity during the time of their cruise, but note that natural variations from year to year can be much larger. (*C & EN*, Feb. 24, 1992).

SCIENTISTS DEVELOP 'SUPER EGGS'

A 'Super-egg' that may reduce the risk of heart disease could be on sale within a year, Australian scientists say.

The egg, developed over the last two years at Australia's New England University, contains fatty acids that scientists believe cut the risk of coronary disease and enhance brain development in babies. "We feel our egg has the right balance of fats that can help combat heart disease, which normal eggs just don't have" said David Farrel, the univerity's professor of nutrition and the project leader.

To produce the eggs, a mixture of fish, cod liver and canola oil is added to the grain, bone, meat off-cuts, vitamins and minerals that make up chicken feed. Health experts advocate increased consumption of fish because it contains the Omega-3 chain of unsaturated fatty acids that reduce the risk of coronary disease. The acids neutralise build-up of scar tissue in the arteries. Canola oil, derived from rapeseed, also contains these acids.

The 'Super eggs', larger than normal eggs, were tested on 45 volunteers who ate two per day for seven weeks. Full results were not yet available but the volunteers did not as a group experience increased cholesterol levels. In the second testing stage, 60 volunteers will eat one egg a day over six months to ascertain long term nutritional benefits. After these tests the superegg will be ready for sale. (*The Economic Times*, May 2, 1992).

GENE AS CULPRIT

Finding the exact genetic cause for serious illnesses has led scientists to locate the common segment of faulty DNA in families with the particular disease. Recently, they seem to have caught the gene which identifies with a mild but highly prevalent form of diabeties known as Type-2.

The gene's identity is a minor surprise. Scientists expected to find the flaws in insulin receptors -- proteins that switch on a cell's sugar breakdown mechanism in response to insulin. What they did find, however, is that the culprit is a faulty enzyme that normally catalyses the first step in the sugar-breakdown process. The finding should lead to better treatment. (*The Economic Times*, May 9, 1992).

COCKROACHES CONTROL

An American Company, Ecoscience Corporation has found a marketing partner for its natural cockroach biocontrol product currently under review by the US Environmental Protection Agency. Under the agreement, Roussel Bio Corporation gets exclusive US distribution rights for the product and is responsible for field development and product registration. Eco Science will manufacture the product and receive royalties.

The cockroach bioinsecticide works much like conventional bait stations. The insecticide and bait are housed in a plastic container called the Bio-Path, which the cockroach enters, thereby becoming infected. In this case, the insecticide is a natural fungus that infects the bug on contact rather than a chemical insecticide which the insect has to eat. The cockroach brings the fungus back to the nest where it infects the rest of the colony and kills them all. (*Financial Express*, Oct. 13, 1991).

Science Briefs

NEEMRICH PESTICIDES FROM NCL

The National Chemical Laboratory in Pune has come up with two pesticides extracted from the seeds of the age-old neem tree (*Azadirachta indica*), which have proved beneficial when sprayed on several crops.

The two, Neemrich-I and Neemrich-II, are the result of intense screening of neem fractions by the NCL scientists in their quest for pest control agents from plants, according to a report by NCL scientist Dr. B.A. Nagasampagi.

Neem seeds are pretty abundant in India, each tree yielding 50 kgs of seeds every year during the season from May to mid-September. During their studies, the NCL team discovered for the first time two fractions from the seeds that served as repellents against the potato tuber moth, a serious pest of potato crops.

Since the active principles in the two fractions were in minute quantities, the Pune researchers developed a simple and economically viable process to get fractions that are rich in the active principles. Modern sophisticated techniques such as high pressure liquid chromatography and thin layer chromatography aided them in their efforts.

Of the two fractions, the first, Neemrich-I, contains unsaturated lipids, triterpenes, sulphur compounds, straight-chain esters and hydrocarbons. It is effective against several aphids, jassids, thrips, cotton white fly and sorghum shoot fly when given in doses of 4000 parts per million (ppm).

Neemrich-II, the second fraction, contains at least 25 triterpenoids and was found to act against many agricultural pests when it was administered in doses of 1000 ppm during field trials. Regular sprays at 15 days' interval gave optimum results in a range of crops, including rice, cotton, tobacco, sorghum, oilseeds, vegetables such as cabbage, tomato and chillies, pulses and cardamom.

Studies in animals have, so far, shown the two fractions to be safe. The NCL process to extract the two fractions has two additional advantages — the inactive byproducts containing mostly saturated fats can be used to make soap or manure, while the residual cake can be used as an animal or poultry feed or manure.

For optimum production of Neemrich-I and Neemrich-II, fresh neem seeds should be processed after two to three months of their collection, and stored seeds should not be processed after two years of storage, NCL scientists say.

— P.T.I. Science Service
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CRYOGENERATOR FOR LIQUID NITROGEN

A group of engineers at the Indian Institute of Technology, Powai, Bombay, have designed and built a Stirling cycle cryogenerator — a plant for making liquid nitrogen — as an import substitute. The equipment is now ready for commercial production.

The project was sponsored by the Department of Science and Technology (DST) in 1986 and completed successfully in 1990. The units have been commissioned and have completed test trials. A meeting and demonstration was held at IIT premises at the end of March 1992.

A number of industries have shown keen interest in acquiring the technology. Apart from import substitution, it will help to reduce the cost. An imported unit today costs nearly Rs. 40 million. It will also give a boost to application of liquid nitrogen (LN), assuring supplies of LN even in remote rural areas.

The group led by Prof. K.G. Narayankhedkar has developed two cryogenerators of five-litres-per-hour capacity and one of 10-litres-per-hour capacity. Liquid nitrogen is mainly used in biology for preservation of human blood and organs, as well as storage and preservation of bull semen for use in artificial insemination.

At present the technology is the monopoly of Phillips Holland where it was developed to cool supersensitive detectors of the Infra Red Astronomy Satellite (IRAS) so that their heat emissions did not interfere with measurement of the faint energy sources. Earlier they used stored liquid helium for the purpose, which severely limited the working life of these satellites.

As of today, there are around 350 imported Phillips LN machines in India, for use in artificial insemination programmes to improve the breed of animals. However, 50 per cent of them are out of order, some due to lack of spares and others due to poor maintenance.

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KIT TO SAVE DIESEL CONSUMPTION

A state-of-the-art mechanical kit that saves nearly 20 per cent diesel consumption by alcohol substitution in heavy vehicles is to be launched soon in an attempt to save about Rs. 300 crores of foreign exchange in diesel imports.

The "Diesenol Retrofit Kit", which is claimed to be the first of its kind in the country, can be easily fitted on to the existing engines of trucks and buses, says Mr. Sudhir Singhal, a scientist from the Indian Institute of Petroleum (IIP),

Dehra Dun. The kit enables a vehicle to operate on a mixture of diesel and alcohol — methanol or ethanol. However, when the alcohol supply runs out, the engine can switch back to diesel, Mr. Singhal explained.

The kit has been developed keeping in view India's unique pattern of fuel consumption, where diesel usage is six times that of petrol, unlike other countries where petrol consumption exceeds that of diesel.

The gadget, which is priced at Rs. 16,000, is expected to save one-tenth of the foreign exchange needed to import diesel. According to IIP scientists, the kit has proved successful in field trials involving about 100 heavy vehicles which together covered nearly 5 million kms in Delhi, Maharashtra and Dehra Dun.

The gadget contains a tank that can carry 200 litres of alcohol and a fuel pump that injects controlled amounts of the alcohol into the engine which is also separately fed by a diesel tank. It is so simple that it can be maintained by any roadside garage or State Transport Undertaking (STU) workshop.

Already seven STUs have shown interest in introducing the device on their vehicles. The technology has been licensed to the Gujarat Auto Projects and Services Ltd. (GAPSEAL) that has already manufactured 100 such kits and is planning to set up a factory in Baroda for commercial supply, according to Mrs. Indu Patel, managing director of the company, said.

The kit offers major advantages: it reduces smoke pollution by 20 to 40 per cent and can operate either with diesel or a diesel-alcohol mixture. It also boosts power efficiency by 5-7 per cent.

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ENERGY-SAVING CHULHA

An official of the Maharashtra Forest Service has developed an energy-saving 'chulha' — Vanjyoti Chulha — which burns compressed dry leaves from forests instead of conventional charcoal or fire wood.

The gadget, designed to make optimum use of this kind of fuel that goes waste today, is a cylindrical tin 22.5 cm tall and 22.5 cm in diameter. Closed on both sides, it has a central hole 7.5 cm in diameter at the top and bottom. One kilogram of dry leaves is pressed into the tin from the top end with the help of a piece of bamboo and is tightly packed. The fire is lit from the hole at the bottom and it will continue to burn for at least two hours, sufficient for cooking for a family of four or five.

The official, Mr. K.K. Chavan, has won two awards for this innovative approach — the Indira Priyadarshini Vrikshamitra award of the Union Government and a cash prize of Rs. 11,000 from the Vasantrao Naik Krishi Udyog Pratishthan.

According to a former director of National Chemical Laboratory, Pune, the compressed leaves give four times more heat than the traditional firewood. Using dry leaves saves trees from being chopped off for use as firewood.

Over 10,000 workers of the agriculture department of Maharashtra Government are presently using Vanjyoti Chulha. It is priced at Rs. 60, but as an incentive for use in villages it is being sold for Rs. 20 to Rs. 30. A village housewife can save Rs. 4 daily spent on firewood today, because the leaves are available free. The chulha can use dry groundnut shells instead of leaves, when leaves are not available.

The Government of Maharashtra has undertaken a special project to use them in residential schools for tribals. T annual expenditure on fuel in the schools numbering about 400 is of t order of Rs. 3.5 crores. This may brought down to Rs. 50 lakhs with t use of the Vanjyoti chulha.

— P.T.I. Science Servi
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CITRIC ACID CONTROLS MORPHINE LOSS FROM POPP

Scientists trying to prevent loss morphine from the fresh latex of popp plants have found that citric acid hel them in the task. The morphine conte of poppy latex declines on contact wi air and sunlight and researchers a trying to identify chemicals that wh sprayed on plants can prevent this los They attribute the loss to activation the enzyme peroxidase.

Studies by scientists at the Narend Dev University of Agriculture a Technology, at Faizabad in Uttar Pr desh, show that citric acid is the mo effective agent. Others that stem mo phine loss are potassium sulphate, zi sulphate and calcium carbonate. Chela ing agents such as citric acid, tartar acid and ascorbic acid inhibit deteric ation of the latex when sprayed alo with sodium chloride.

— P.T.I. Science Servi
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SOAPNUT DEGRADES ROCK PHOSPHATES

Indian rock phosphates with a litt soapnut pericarp powder form an exce lent fertiliser for crops, concludes study by the Regional Insititute Technology, Jamshedpur.

Soapnut pericarp has been found degrade various Indian rock phosphat when suspended in water for some tim the best results coming with a 0.3 p cent soapnut solution at the end of days.

The degradation is due to interaction between the active constituent of soapnut pericarp — a dihydroxy acid — and metallic ions released by hydrolysis of rock phosphate. This interaction releases several water-soluble phosphates which can serve as inputs for fertilisers.

The findings follow trials by scientists at the Department of Chemistry, Regional Institute of Technology, Jamshedpur, on rock phosphates obtained from Jaisalmer in Rajasthan, Mussoorie in Uttar Pradesh and Itagarh in Bihar.

Their analysis shows that the Uttar Pradesh rock phosphate is the richest in phosphate content, while Rajasthan samples have the highest lime content. The studies also showed that with lapse of time, as the concentration of soapnut pericarp increased, so did the release of phosphatic contents.

After 28 days, optimum results were obtained with a 0.3 per cent solution of soapnut pericarp which released about 75 per cent of total phosphates in rocks in the Rajasthan samples, 70 per cent in Uttar Pradesh and 50 per cent in Bihar ones.

"....Indian rock phosphates along with a little soapnut pericarp in the powder form may be used as excellent phosphatic fertilisers for better crop yield," concludes a report by Jamshedpur scientist D.N. Pathak, published in the "Proceedings of the National Academy of Sciences."

— **P.T.I. Science Service**
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TISSUE CULTURE TO TACKLE COCONUT ROOT WILT

Scientists in Kerala are perfecting tissue culture techniques to screen plantlets resistant to coconut root wilt, a centuries-old-problem in the state. Annual losses due to root wilt in coconuts are estimated at Rs. 500 crores in Kerala where the only way for farmers to tackle the disease is to cut down all affected trees and replant new ones.

Studies at the Kerala Agriculture University show that mycoplasma like organisms (MLOs) cause root wilt via the lace bug which acts as the vector. Scientists at the university cultured tissues of one- or two-year-old seedlings using mineral medium supplemented with kinetin and activated charcoal.

Embryos rose directly from the vascular tissue in the leaf. These later got separated from the parent leaf segment after six to eight weeks, sprouted and developed into plantlets, according to K.P. Sunil, a scientist.

Healthy seedlings with vigorous rooting were obtained, says a report in the *Indian Coconut Journal*. Adjusting the mineral and hormone levels in the medium can bring down the plant initiation time to three weeks, the report says.

From the time of collecting the tissue, it took six to eight months for a plantlet to develop to about six cms height. The scientists also worked on tissues from tender leaflets of coconut trees showing root wilt symptoms, and found that about 50 per cent of the embryos from such cultures germinated and grew into seedlings that are in various stages of development.

The current emphasis in root wilt research at the university is on identifying resistant cultivars and culture of the root wilt pathogen. A permanent solution to the problem means saving over a thousand million nuts, 26 per cent husk, nine per cent copra and 11 per cent oil every year.

— **P.T.I. Science Service**
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A NEW VARIETY OF FRENCH BEANS

Researchers at the Central Research Station, Wakavali, under Konkan Agricultural University, Dapoli, Maharashtra, have developed a new variety of French beans called "Konkan Bhushan". The new variety grows up to 60-70 cm only and, therefore, does not require any trellies or supports to keep the plants well above the soil. Thus, it can also be grown in kitchen gardens as well as in fields.

An average plant yields about 160 beans with a length of about 12-15 cm. The yield per hectare is about 8-10 tonnes. Being sensitive to light, the beans can be grown at any time of the year. However, as a crop they are planted in early monsoon and the harvest is ready by late monsoon months. Beans are grown widely throughout India but form a major crop in Maharashtra, Madhya Pradesh, Andhra Pradesh and Tamil Nadu.

— **P.T.I. Science Service**
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NEW MICROCAPSULES FOR DRUGS

Pharmacists at the Jadavpur University in Calcutta have prepared microcapsules of cellulose acetate phthalate that can serve as coating material for a range of drugs. An added attraction is that the new microcapsule can encapsulate the asthma drug salbutamol sulphate, which is not possible to do so with current non-toxic biodegradable polymer used to coat drugs.

It also increases the clinical response of drugs and diminishes their side-effects, the Jadavpur researchers report. They prepared the microcapsules by dissolving about one gram of cellulose acetate phthalate (CAP) in 10 ml of acetone-methanol mixture, and emulsified the drug with the help of 1000 ml of heavy liquid paraffin.

Working with microcapsules of different sizes, the team found that the diffusion coefficient of the drug varied with the diameter of the microcapsule. The studies on the kinetics and diffusion

characteristics of the microencapsulated drug show that the coating material starts dissolving at or beyond pH of 6, whereas diffusion of the drug occurs at a pH of 1.2.

— P.T.I. Science Service May 16-31, 1992, p. 4

FIRE-RESISTANT WOOD SUBSTITUTE FROM FIBRE

Scientists have produced a fire-resistant substitute for wood from coir fibre, a renewable resource found abundantly in southern and coastal states. The substitute "polycoir" developed at the Regional Research Laboratory (RRL) in Trivandrum has mechanical properties of tough plywood and can be used on door and acoustic panels.

Polycoir is a thermoset mouldable natural fibre polymer composite. RRL and the Coir Board are jointly setting up a polycoir technology demostration plant in Bangalore. "Polycoir will have an enormous potential as a substitute for wood," says Dr. A.D. Damodaran, RRL Director.

The materials is fire-retardant, water resistant and termite proof, say RRL scientists whose work on coir is part of a programme aimed at finding industrial uses of locally available raw materials. A medium-scale polycoir production plant could be set up with plant and machinery costing Rs. 25 lakhs, and a working capital of Rs. 30 lakhs, RRL scientists have estimated.

According to RRL scientists, the cost of production of high density polycoir intended for door panels would be about Rs. 300 per square metre, while low density polycoir for use as acoustic panels would cost about Rs. 80 per square metre.

The process involves four basic steps: making needled-felt coir, impregnation of this coir with a resin, hot pressing the pre-preg into final shape, and finishing operations.

The major equipment needed are needled-felting machine, polymer impregnation unit, hot air drier, and hydraulic hot press.

— P.T.I. Science Service May 16-31, 1992, p. 5

BODY ARMOUR GOES PLASTIC

Body armour for warriors started with turtle skins, gave way to iron and now to the marvel of the 20th century — plastics. Introduction of recent plastic technologies is specially relevant to India where the army and paramilitary forces are combating terrorism.

The first body armours in Europe were worn by the horsemen of Charlemagne in the 8th century A.D. Earlier they used shields made of turtle skin or bronze. Chainmail — armours of interlaced rings or overlapping plates — came much later. Chainmail was made from rings of iron wire rivetted or welded together and shaped to cover the arms, feet and head. They had the twin advantages of flexibility and strength.

By the 14th century, plate armour, originally a reinforcement for chainmail, was beginning to take its place. The shield was also in use by infantry soldiers. Much of the credit for inventing body armours made out of glass fibres and synthetic materials goes to the research wing of the American armed forces. During World War I, British soldiers, much to their surprise, had discovered that a thin layer of natural silk garment could stop low-velocity sharpnels from hand grenades.

The body armour made of plastics followed the invention of fibre glass and nylon. When Du-Pont chemists invented nylon in 1935, it was found to be considerably stronger than silk. Nylon fabrics could be made four to five times stronger than steel, but much lighter, and nylon jackets used in World War II are reported to have saved nearly 50 per cent of casualties among the Allies. Doron and nylon were the materials favoured by the American armed force Doron, named in honour of Col. Dori of the US Army, consisted of layers o fibre glass filaments which were lami nated conded together with resins unde high pressure) to form a thin sheet.

Tests demonstrated that a 3-mm-thic sheet of doron could stop and partiall flatten a bullet coming from a distar enemy. Without an armour the ski could be pierced by a sharpnel. But n harm results if the impact is spread ove a sufficiently large area and that is wha doron plates did. They offered enoug resistance to absorb the energy of thes missiles so that they spent themselve at the point of impact.

A 12-ply spot laminated basket weave nylon presented a less rigid sur face and entangled the missiles in mesh of strong nylon fibres, each o which contributed its bit towards tota resistance that smothered the velocity o these flying objects.

The first tests on humans were car ried out by two doctors, Webster an Corey of the US Army, using a .45 calibre pistol. Webster fired it from distance of six metres on Corey's han covered with a doron or nylon glov Corey experienced no injury or discom fort. Another test with a life jacket con firmed its utility.

After the end of World War II, bod armour research was resumed in 1947 It was proved beyond doubt that a 3-mm doron and 12-ply nylon could stop mos fragments from grenades.

In the summer of 1951, a new bod arm vest combining overlapping curve doron plates with flexible pads of 12-ply basket-weave nylon was perfected. I could stop a .45-calibre or sub-machin gun bullet coming from a moderate dis tance, all the fragments of a hand gre nade at one metre, 75 per cent of 81-mm mortar at three metres and the full thrus of a bayonet. In the Korean War, front line American soldiers wore vests mad

f nylon or doron. These armours, howver, did have their limitations. They ould not stop a direct close range hit rom a rifle or machine gun and would ot hold off all shell fragments.

Chemists were on the look-out for a ew plastic of lighter weight but with etter ballistic resistance than doron and ylon. Their search led them to tamper vith the molecular structure of nylon vhich is essentially a polymer. The ound that the polymer units could be tiffened with the addition of one or nore aromatic groups or molecules of enzene.

The research resulted in the invention f Kevlar by Drs. Stephanie Kwolek nd Herbert Blades at the Du Pont esearch laboratories. The process is a losely guarded secret. The aromatic olymers, called aramid by DuPont, could not be melted and spun into fibres.

The next breakthrough came in 1965 when Dr. Kwolek found a solvent that lissolved kevlar. Spun into fibre, it was stiffer than glass and very hard to cut even with a pair of scissors. The solvent is another DuPont secret. Kevlar was originally developed to replace steel cord used in making belted steel radial tyres. In 1971, a lawyer suggested that it might make an excellent body armour.

Samples of vests were made and in a trial, 100 goats dressed in Kevlar vests were shot with .22 and .38 calibre pistols. Only one of the goats suffered a broken rib, but all of them were alive after the test. Army researchers were surprised to find that so light and pliable a plastic can halt a streaking piece of lead in a bullet. Kevlar revolutionised the science of making armours for soldiers as well as dignitaries.

Kevlar does not char until about 425°C and can withstand brief contacts with materials as hot as 760°C, which makes it an ideal substitute for asbestos, a material considered dangerous as it causes lung diseases. Kevlar is so light and flexible that it can be sewn even into ordinary clothes. One can buy a complete line of bullet-proof clothes conforming to the latest fashions in the United States. The price, however, depends upon the desired protection. Even vests plated with gold have been ordered by some dignitaries.

Multi-layered structures of Kevlar clothing help distribute and dissipate the energy in a speeding bullet. Even then a person using them will feel the impact. The experience is something like being hit with a blunt hammer.

Kevlar bullet-proof vests worn by the US police weigh about 1.5 kg. the vests meant for soldiers and guards attached to VIPs are superior to these. They can stop even a high-velocity rifle bullet. Even fencers use them.

Kevlar is also used in making security blankets for defusing bombs. A Kevlar blanket thrown over a bomb can smother it and prevent splinters and sharpnels from flying in the air in all directions.

Plastic technologists have come out with another material that is 10 times stronger than steel and 35 times stronger than Kevlar. The new plastic fibre called "Spectra" is polyethylene with an extremely high molecular weight. It can also be used for making body armour. It has a specific gravity of 0.97 grams per cubic cm, making it even lighter than water.

With the liberalised economic policy, it is time some Indian businessman puts up a factory to manufacture Kevlar and Spectra with appropriate collaboration. There is an assured market for the army and paramilitary forces fighting terrorism. In addition to body armour, the two materials have many civilian uses.

— P.T.I. Science Service
May 16-31, 1992, p. 6

TRANSGENIC PLANTS MAKE BIODEGRADABLE PLASTIC

Scientists at Michigan State University in the U.S. have succeeded in genetically altering a plant so that it produces a biodegradable thermoplastic. The plastic, poly-D-(-)-3-hydroxybutyrate (PHB), is naturally produced by soil bacteria and can be used in containers, wraps, and coatings reports the journal *Chemical and Enginnering News*.

The cost of PHB derived from bacterial fermentation, though is "substantially higher than that of other biomaterials, such as starch or lipids, that accumulate in many species of higher plants," according to Chris Somerville of the Department of Energy's Plant Research Laboratory at Michigan State University, East Lansing, and his coworkers.

The researchers wanted to see whether the bacterial capability to synthesize PHB could be transferred to higher plants. To accomplish this, they introduced two bacterial genes into a plant that has a simple genome. The two foreign genes each encode an enzyme that is missing in the plant but is essential for PHB biosynthesis.

The genetically engineered plants produced PHB granules that are very similar to granules oberved in PHB-producing bacteria. However, the plants were stunted and produced fewer seeds than normal. Additional genetic manipulations will be necessary to produce large quantities of novel biopolymers in agricultural plants, the researchers have concluded, the *CEN* report said.

— P.T.I. Science Service
May 16-31, 1992, p. 10

QUICK DISPOSAL OF MEDICAL WASTES

A Japanese company, Osaka Iryo Kogai Giken Kyodo Kumiai has deve-

loped an apparatus which automatically performs thermal decomposition at high temperatures. It also carbonizes infectious medical wastes and contaminated small animals from medical and research institution experiments.

Waste for disposal includes carcasses of small animals used for experiments, animal wastes such as removed internal organs, chromosomes, and plant wastes used for various experiments.

Currently, this waste is now disposed by freeze-dry or micro wave processes, which take a few days and are likely to cause bad smells and decomposition during storage at room temperature. Disposal time using this apparatus is less than 4 hours, reports the journal *Technojapan*.

The residue left behind is cabonised protein which has no smell, is dry, does not decompose at room temperature and can be disposed like ordinary flammable waste. The apparatus consists of a carbonising furnace, re-burning deodorizing furnace, exhaust cooling furnace, and control system, the journal said.

There are 2 models, one operated by gas and the other by electricity, and comes in 2 sizes of disposal capacity, 3 kgs and 6 kgs. The price for each model is projected to be less than 10 million yen.

— P.T.I. Science Service
May 16-31, 1992, p. 10

NEW DELAY-ACTION FERTILISER

Mitsubishi Chemical Industries Ltd., has developed a delayed action fertiliser with long-lasting effectiveness by altering the solution of the fertiliser components, reports *Technojapan*. The effectiveness period of the fertiliser is 100 days for paddies and 120 to 13 days for field. Size of the fertiliser is th same as ordinary fertilisers and it ca be spread by a machine.

The name of the fertiliser is SUPER IB and that of the improved, delayed action fertiliser is IBDU. Super-IB made by hardening the components o IBDU in layers using formaldehyde a the coagulant. It has few chinks and small contact area with water, the jou nal said.

A previous approach to the delaye action fertiliser was to make the grain bigger. However, it bacame difficult t spread by machine. Because the size o the new fertiliser is the same as ordinary fertilisers, with a diameter of 2 mm to 3 mm and sufficient hardness, it ca be spread by machine.

— P.T.I. Science Service
May 16-31, 1992, p. 1

Powder Coatings: A Fast Growing Market

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Preface

The paint industry is now a well established and mature industry. A number of new technologies have emerged which are lifting the image of the paint industry to a technology oriented industry. Although the change has become pervasive in almost every aspect of the paint and coating industry, the trends are directing development towards lower solvent, higher performance and lower cost coatings. Environmental regulations, while most prominent, are not the only factor causing change. There are other trends that should be noted in any forecast of developments. Speciality substrate and high performance maintenance coatings will be among the fastest growing markets in the coming years.

Most industrial finishes originate in liquid organic coating materials, then dry by evaporation of organic solvents and, in many cases, subsequent chemical cross-linking reactions. Normally these two steps of the finishing process are accelerated by means of heat in order to get reasonable drying cycles in mass production.

What does this mean for ecology and economy? Drying by evaporation releases considerable quantities of aliphatic and aromatic hydrocarbons, esters and other solvents. In a conventional finishing line for car bodies a consumption of 4500 Kg. top coats for 400 units per day results in 2060 Kg. effluent solvent, not considering the contribution of the prceeding primer and filler application. In addition to this, by polycondensation reaction most common crosslinking agents form cleavage products such as methanol, butanol or formaldehyde which contribute to air pollution, if not eliminated. In the Federal Republic of Germany alone each year about 300,000 tons of solvent evaporate into air and about 150,000 tons of paint sediment are obtained in the processing of solvent-bound paints. From this it is possible to get an idea of the amount of pollution the paint industry is creating. Therefore many countries issue restrictions in order to protect the environment.

The problem of pollution has confronted the coating industry for years. Regulations to control hazardous substances are, of course, not new for the paint industry. There is a growing concern among all to evolve suitable technique to alleviate and overcome pollution with a view to improve the quality of life.

The ecological requirements have been continuously forcing changes in the technologies of paint for industrial and domestic coatings. However, the introduction of Rule 66 (adopted by Los Angeles country in 1966 to restrics the use of organic solvents) caused major changes in the research priority of the paint industry. The paint industry has responded to these regulations by either controlling the solvents from entering the environment designing formulations with less or no solvents. The need for low emissions coatings has necessitated developements in powder, high solids, water borne and radiation curing coatings. Among these powder coatings have got acceptance worldwide.

Just a decade ago, powder coatings were considered by many to be an experimental coating system, perhaps just a passing fad, and limited to a few specialised applications. Today, they are the fastest growing finishing technology in the Western World with a growth rate of 15-20% per year until at least 1995. Powder coatings use is expected to grow at a rate of more than 9 percent in the mature Western European market over the next three years compared to no growth for other coatings.

Historical Background

Since 1950 upto 1965 powder coating was done by fluidised bed application using thermoplastic coatings. The process generated only limited interest, mainly from custom coaters. There was a real boom to the use of powder coatings when an electrostatic spray gun was introduced and thermosetting resin systems were found applicable. It was estimated that the consumption of powder coatings would round 208,000 MT, with North America accounting for just under half of the total. In reality, the worldwide market for powder in 1980 was only 74,000 tons with the bulk of consumption taking place in Europe.

What was the reason? In Europe, manufacturers were quick to appreciate the decorative possibilities of powder coating but the North American market reacted more slowly than Europe. Application and material problems combined with a market resistance to turning away from high solids contributed to slow the take-off of the powder coating technology. This dependency upon high solids or, more accurately, the perception of what high solids could accomplish, was a major reason for the slow growth of powder coatings in North America. In addition, the powder coating market in the U.S. was not well organised.

After a decade of slow growth, sales of powder coating materials and equipment surged in the early 1980s. Part of

this growth evolved from the marketing strategies. The major impetus for growth, however, can be attributed to three major factors. Increasingly stringent environmental regulations forced many manufactureres to search for alternative finishing technologies to remain in compliance with the laws. As a virtually pollution free finishing system, powder coating attracted a great deal of attention and won many converts. Escalating energy costs also created a purserasive argument for powder coating. A dramatic leap forward in materials and equipment technology was also a major factor in powder coatings new found popularity.

Modern powder coating technology produces a superior quality finish, which competes with solvent-based coating and at same time offers superior surface properties and better process economics, competitive capital investment costs, high operating efficiency created by increased material utilisation, reduced energy and labour costs. The elimination of solvent emission reduces overall finishing, can produce high quality product at lower costs, increase profitability, and comply with environmental regulations.

Powder Coatings

Powder coatings can be described as a solid paint. It is applied through a special gun which electrically charges the particles and deposits them on to an earthed article. The charge allows the particles to remain adhered to the substrate and when baked the particles fuse together and the polymers crosslink to form hard abrasion resistant coatings. There is an ever-increasing variety of powder coatings to choose from and the final selection will depend on the end use and requirement of the coated substrate.

Powder coatings are finding extensive applications as car primers and in a wide range of industrial products such as under-the-hood automotive parts and wheels, household ranges, microwave ovens, washing machine lids and doors, electrical transformers and enclosers etc. The growth of powder coating for decoration and protection of industrial products today are due more to economic reasons and the desire to obtain quality finish than to regulatory compliances.

Polymers used for powder coatings can mainly be classified into the following two groups: Thermoplastic and thermosetting powders. Thermoplastic powders are temperature sensitive and involve no chemical reaction after application, while thermosetting powders, on the other hand, are low molecular weight materials which undergo polymerisation or cross-linking on heating after they are applied to the substrates. Thermoplastic powders included cellulose acetate butyrate, polyesters, vinyl polymers, polyvinyls, polyolefins, ionomers and thermosetting powders include epoxy, acrylic and polyester resins.

In thermosetting systems the polymer is a low molecula weight species which melts and flows during fusion an undergoes a chemical conversion to a thermoset cured co dition. Once this condition has been achieved it can no long be re-melted to a plastic condition. The components require for the manufacture of thermosetting powders are as follow polymers, hardners (catalyst, curing agents), pigment extenders and flow control additives.

Advantages and Limitations

The worldwide success of powder coating is attributed the well known five E's

(1) Excellence of finish
(2) Ease of application
(3) Energy savings
(4) Ecology
(5) Economics

There are number of advantages of powder coatings ove liquid coatings. Some of these are as follows:

(1) Ease of application
(2) Required coating thickness can be obtained in a singl coat application
(3) Excellent edge covering
(4) High material utilization
(5) Cleaner working conditions
(6) Virtually no atmospheric pollution
(7) Reduction of wastage by recycling the powder
(8) Environmental safety due to absence of solvents
(9) No requirement of primer coat; direct finishing co can be applied.

Some of the negative factors of powder coating need t be considered and the extent to which these could affe growth of the market.

(1) Intermixing of powders to get blend or for tinting pu pose is not possible, such mixtures give a pepper and sa apperance. As a consequence small batches are impracticabl

(2) The cost of setting up a production unit for 30 tons/annum output for a general range of products was o the very high order ($ Australian 500,000 in 1980). Economi sense suggest that a manufacturer entering the market shoul be assured of sufficient sales opportunity to utilise new capac ity within a reasonable time.

(3) Until recently, colour change has necessitated dupl cation of applications equipment, especially spray booth ducts and cyclones to reduce the down-time for cleaning th

TABLE 1

Sr. No.	Consideration	Liquid		
		Conventional	Electrostatic	Powder Coating
1.	Price of Coating Material	Rs. 60/lit	Rs. 60/lit	Rs. 170/Kg
2.	% Solid Content	50%	50%	100%
3.	Flim Thickness	50 Microns (2 Coats)	50 Microns (2 Coats)	50 Microns (1 Coat)
4.	Efficiency (Material Utilisation)	25%	50%	97%
5.	Coverage	2.5 sq.m/lit	5 sq.m/lit	12 sq.m/lit
6.	Labour Charges	Rs. 25/hr	Rs. 25/hr	Rs. 25/hr
7.	Coverage of labour	10 sq.m/hr	12.5 sq.m/hr	50 sq.m/hr
8.	**Investment**			
	Equipment	Rs. 1,500	Rs. 50,000	Rs. 50,000
	Booth	Rs. 50,000	Rs. 1,50,000	Rs. 50,000
	Oven	Rs. 1,20,000	Rs. 1,20,000	Rs. 1,20,000
9.	Oven Capacity	60 KW	60 KW	60 KW
10.	Curing Schedule	120°C/30 min	120°C/30 min	180°C/10 min
11.	Electric cost	Rs. 0.8/kw/hr	Rs. 0.8/kw/hr	Rs. 0.6/kw/hr

system. Small colour runs are often performed without reclaim of overspray powders to avoid this problem.

(4) Coating film thickneses are normally not less than 50 μm, and the resins used in powders would be classed amongst the more expensive types used by the paint industry.

(5) Although the cost of installing a line for applying, reclaiming and stoving powder compares favourably with the cost of a wet paint line, a paint user may neverthless decide to defer a decision to use powder until the need to expand or replace existing equipment.

(6) Before applying powder coating, surface should be properly cleaned, prepared and phosphated, which increases cost of coating.

The major breakthrough in powder coating material has been the development of resin systems to meet the diverse needs of metal finishing operations. In thermosetting type the epoxy resins were used exclusively during early years and continue to be used way for a range of applications. But due to poor outdoor durability epoxy is losing some of its dominance in the world market. In the North American market today, the use of polyester, urethane is increasing, epoxies are decreasing and acrylics are holding their own as a small segment of the market. Acrylic urethanes are still a major factor in the appliance market and are gaining acceptability in the automotive and aluminium extrusion industries.

Current research efforts are focussing on developing lower cost coatings, low curing powders and a good outdoor durability to compete with automotive acrylic. Resin manufacturers have been studying weatherable epoxies that resist chalking or fading in sunlight, and are experimenting with ways to improve coating smoothness with acrylic and polyester resin systems.

A comparison of cost of powder coating to that of liquid by conventional and electrostatic spraying methods (see Table 1) would reveal that powder coatings work out to be cheaper in the long run.

Market Situation and Economics

The various powder coating systems that have emerged in last 20 years include most of the polymers used in the conventional solvent borne coatings. At the same time the production costs have been lowered due to continuous market growth. A combination of sharp price increase of solvents and 'oil shock' in 1970s, have led to prices of powder coatings becoming comparable to wet coatings. Therefore powder coatings today are recognised not only as environmentally friendly systems but also as materials that can complete succesfully in price with the solvent- and water-borne coatings.

In high-tech areas where powder coatings are commonly used, apart from environmental aspects, price is an even more important criteria. In this area, powder coatings satisfy almost

all stringent requirements by the end users, failing only in cases where an extremely good flow of the coating is expected.

The market share of powder coatings compared to other types of coating materials is not large. However, in a relatively nature field like the paint industry, powder coatings are among the few still enjoying a considerable growth in volume per year. According to available marketing data, the world wide market for powder coatings was 74,000 tons in 1980 and 142,000 in 1985, with a prediction of 250,000 tons for 1990. The annual growth rate in the period 1980-1985 was 11% in Europe, 12% in the USA, 25% in the Far East and 14% for the rest of the world. The figures for the period 1985-1990 are 9.5% for Europe, 15% for the USA, 13.6% for the Far East and 12% worldwide. A 10-12% average annual growth rate in consumption of powder coatings for the period 1990-1996, with a total production at the end of this period of 230,000 tons, has been indicated for Europe. Europe, where the powder coatings were invented, is still the biggest market. Table 2 shows the production and market shares of power coatings in different geographical areas during 1988.

TABLE 2

The world market for powder coating by region for 1988

	Tons	%
Europe	112,000	50.9
North America	46,000	20.9
Far East	34,000	15.5
Rest of World	28,000	12.7
Total	**222,000**	**100.00**

The type of powder coating used in different geographical loacation varies considerably. For example, the three major market areas in the world: Europe, the USA and Japan, have developed completely different systems for exterior use, due to historical reasons and raw material availability. Systems based on carboxyl functional polyester resins/TGIC are the most popular in Europe. In USA polyurethanes with aliphatic isocyanates as cross-linkers are market leaders. In coatings for indoor applications there is a big difference (see Table 3). Hybrid systems based on carboxylated polyester/epoxy resin are most popular in Europe. In the USA pure epoxies cross-linked with dicyandiamide are the main class competing with the polyurethanes. Table 3 presents average figures for the market shares of five types of powder coatings worldwide worked out from different data.

The first area to be invaded by the powder coatings, was the metal furniture industry, and it is still very important. Hybrids are the main types used for the purpose, while for outdoor furniture (e.g. garden furniture) polyester/TGIC or polyurethane are the common systems used. The domestic appliances industry is an important consumer of powder coatings. Appliances applications in total currently represent 30% of the total market for powder coatings in USA. In Europe hybrids are the main types used since a mild orange-peel effect is acceptable. In USA a smooth finish is preferred and therefore polyurethanes are much more common. Typical products of the appliance industry that are coated with powder coatings are food freezers and refrigerators, water heaters, toasters, washing machine lids, domestic cookers, electric and gas heaters etc. General engineering is one of the largest market for powder coatings. Since the role of the coatings is mainly functional, the low cost hybrids and epoxy systems are preferred. The automotive market is one of the most demanding, with regard to the protective and decorative characteristics of the coatings. In Europe, there is wide acceptance of polyester/TGIC system, which continued the market growth of exterior powder coatings. Same is the case for polyurethanes in USA. Another big market for powder coating is in corrosion resistant types for pipes and reinforcement bars (rebars). The area is dominated by pure epoxies. In Europe the rebar market has been largely ignored, but its importance from a technical point of view has been recognised and this is an area where considerable growth can be expected.

TABLE 3

Market shares of different types of powder coatings (%)

	Europe	USA	Japan
Epoxide	30	38	36
Epoxy/Polyester	47	14	26
Polyester/TGIC	18	15	11
Polyurethane	5	33	15
Acrylic	-	-	12

TABLE 4

Powder coatings end-use market (%)

	Average %	Europe	USA
General engineering	25 - 35	38	42
Corrosion resistance	10 - 20	14	-
Domestic appliances	10 - 20	10	30
Automotive	10 - 15	8	24
Exterior	10 - 20	13	4
Metal furniture pipes	--	5	--

Table 4 gives % share of various end-use markets of powder coatings since there are differences in the statistical classification in different areas.

Table 5 shows the end-use markets break-up of thermoset powder coating in the USA. Appliances and automotive

together accounted for 54% of the total powder consumption in the range of 38 million pounds. Projected annual growth for USA powder coating market sectors over next five years are shown in the Table 6.

Table 7 reveals 1990 world production of powder coating by resin type on percent basis. Epoxy-polyester hybrid lead the pack with 40 percent share (83,029 tons); epoxy powders have been declining in use over years, but still retain a respectable 29% (59,973 tons) market. The final three are TGIC-based polyesters at 17% (36,687 tons), polyester urethanes at 13 percent (27,545 tons) and acrylics at 2% (3,516 tons).

TABLE 5

Thermoset powder coatings (USA end-use market)

Appliances	30%
General metal finishing	42%
Automotive	24%
Architectural	4%

TABLE 6

Projected annual growth in USA powder coating market (1990-1995)

Appliances	+ 12%
Automotive	+ 19%
Architectural	+ 40%
General metal finishing	+ 21%

TABLE 7

Powder coating: World production by resin type

Polyurethane	13%	27,545 tons
TGIC	17%	36,687 tons
Epoxy	29%	59,973 tons
Acrylic	2%	3,516 tons
Hybrid	40%	83,029 tons

TABLE 8

Powder coating production in Western Europe by resin type

Resin type	1990	2000
Polyester/TGIC	29%	33%
Epoxy	12%	5%
Polyurethane	8%	6%
Hybrid	51%	56%
Total Production	1990: 156,000 tons 2000: 305,000 tons	

Table 8 indicates the powder coating production in Western Europe by resin type. Hybrid combination seems to be most popular in Europe.

Growth of the world powder coating market is given in Table 9. While regional break down of world production of powder coating by region (1990) is presented in Table 10.

TABLE 9

Growth of the world powder coating market

('000 tons)

1984	128
1986	170
1988	225
1989	260
1990	290
1992	358

TABLE 10

World production of powder coatings by region (1990)

Western Europe	54%
Asia	17%
North America	12%
Rest of World	17%

Future Prospects

Although the production of colour powders has generally made it necessary to manufacture minimum batches of about 400 Kg. to offset the cleaning downtime in production plants, this has not been a deterrent to the growth of the market for powder coatings. It is significant that a large number of jobbing enamellers have switched much of their work to these systems. The production capacity for powder coatings has matched demand despite the capital cost of manufacturing equipment and this situation is likely to continue. It seems probable, however, that capital costs and the specialised nature of powder coatings will restrict proliferation of manufacturers, although this has not been the situation in the UK.

When powder coating economies is compared with the other VOC (Volatile Organic Compounds) compliance coating options, one has to take into account all of the expenses connected with the coating process. On-line operating advantages reported for powder coatings compared with other environmentally friendly systems are on application transfer efficiency or utilisation of the material from 95% up to 99%; 30 - 50% less energy consumption combined with a reduction of labour expenses of 30 - 40%; and reduction of waste material accounts for fewer rejects due to surface defects. Colour change has been made easier as equipment suppliers

address themselves to the problem, and further developments in this area can be expected. Already systems are available that eliminate the need for lengthy ductwork and cyclones. Colour change 'at the gun' has also been vastly simplified with change over powder hoppers and feed lines. Where a single powder application replaces two wet coats of paint, the material cost alone is invariably in favour of powders. For single coats of wet paint, the economic justification for powder can, in many cases still be proven through other factors:

(1) Reduced energy costs (especially oven and factory head losses)
(1) Ease of adaptability to automatic applications
(3) High level of reclaim of overspray; and
(4) Improved performance and reduced rejects

Powders are being produced with fine, controlled particle size to allow lower film builds (35 to 40 µ m) to be applied, and wider availability of these powders can be expected. Applicators with existing wet paint equipment have in some instances found that it is more expensive to modify their operations to comply with requirements of environmental protection authorities than to convert to powder system.

The total liquid coatings market in Canada and USA declined from 1010 million gallons (3823 million litres) in 1980 to less than 1000 million gallon in 1990. Because of environmental problems, the solvent content of the coatings has decreased but spectacular growth has been in powder coatings which now account for about 7 percent of the total industrial coatings market. 127,000 tons of powder coatings were consumed in Western Europe in 1989. The hybrid (epoxy/polyester) share of the coatings market in Europe is much higher than that in the USA. The percent market there in 1989 for European countries was as follows: Italy (24%), Germany (24%), France (13%), UK (13%), and rest of Europe 26%. 27,000 tons of powder coating were consumed in Japan in 1989.

Indian Scene

The emergence of powder coatings represented a breakthrough in a world troubled by the pollution of the environment. The progress achieved since then in the use of powder coatings has been spectacular. The impetus to the rapid expansion in the field has come from significant technological development in equipment manufacture and improvement from predictable performance of finished goods. India has to go in a long way in showing concern for clean air, in the same measures as the Western countries, but the cost benefit concept, in the background of the high cost of solvents, higher material utilisation and one-coat finish has automatically acted as an inducement to the users to pitch for powder coating which now represents an area of tremendous importance i the Indian paint industry's future growth, particularly in th background of the industry's attempt to replace conventiona stoving finish with this technology as a cost saving measure In fact, the production of the powder coating is expected to double in the next three to four years and may reach a level of 5,000 tons from the current annual production of 2,500 tons.

It is more than a decade since powder coating industry has been in existence in India. From a modest beginning of not even 100 tons in 1981, the figure is likely to reach 2500 tons in the current financial year. From world standards, the growth may not be impressive, but from the Indian paint industry's point of view, powder coating is the biggest growing sector. Last year the growth of the local paint industry, in volume, was hardly 1%, whereas the powder coating segment witnessed an increase of more than 20%. It is to be noted that 1991 was a year full of set-backs in one form or the other — Gulf crisis, foreign exchange reserves dipping to the lowest figure of less than Rs. 2,000 crores, inflation reaching 14 -15%, devaluation etc.

TABLE 11

Powder coating consumption in India by resin type

	1991 (tons)	1995 (tons)
Hybrid	1000	2000
Epoxy	1000	2500
Polyester/TGIC	100	600
Polyurethanes	100	300

TABLE 12

Powder coatings: Growth in India

	(Qty., '000 Kg)
1985	300
1986	400
1987	600
1988	900
1989	1200
1990	1450
1991	1700

With the wide coverage and newer uses for powder coatings there is a tremendous growth potential in India. The consumption of powder coatings is expected to grow to an estimated level of 7,000 tons within the next five years. However, there is considerable amount of technical back up necessary for the development of the powder coating business and companies with a strong R and D set up and technical service teams would stand to benefit to a major extent. At

present, not even 100 tons of such powders are produced for exterior purpose. The demands for window frames for exterior exposure will improve the market share in the coming years. The precoated steel sheets may open new vistas to this market in future. Thus a 500 tons market is expected to be available in the next 2-3 years.

Table 11 shows the powder coating consumption in India by resin type as percentage of the total market. While powder coating growth in India is shown in Table 12.

Worldwide Development Trends

Developments now being commercialised or still in the research pipeline are likely to make powder coating an even bigger player in the North American metal finishing field. New generations of applications equipment are being designed and powder manufacturers are developing a variety of new resin systems. The development can be as follows:

(1) Ultra-thin powder coatings of 20-25 microns.

(2) Low temperature curing powders as low as 120°C specially for substrates like wood, plastics, FRP articles and sheet mould compositions.

(3) Pre-powder coated metal sheets competing with coil coatings.

(4) Improvement of decomposition efficiency, thereby eliminating the need to reclaim and reuse the overspray powder.

(5) Improved weathering resistance systems (polyester/TGIC) than existing ones.

(6) Powder coating technology in automotive industry aimed at producing high performance coating with low (or Zero) volatile organic content (VOC).

Throughout the nineties, powder coatings will domimate the North American automotive finishes industry. In the latter half of 1990 it is expected that water-based top coat/powder clear coat systems are likely to be in common use.

Final Thought

As public concern over air and water quality and waste disposal problems continue to grow, more segments of the metal finsihing industry will face rigid environmental demand. Those demands, coupled with rising energy costs and tough competition, will continue to expand the opportunities for the wider utilisation of powder coating. The research and development efforts underway within the powder coating industry assume that new technology will continue to become available, providing expanding opportunities to utilise powder coating as the quality finishof choice.

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Inorganic Trace Elements as Water Pollutants

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ABSTRACT

The effective management of inorganic contaminants of surface and subsurface water has long been the goal of professionals in public health and the environment. Although the greatest progress has been made in controlling some of the sources of those contaminants, the sheer weight of population and economic growth during the 1990's will likely off set many of these gains. The present study reveals an information base for the management of inorganic contaminants in an era of reduced environmental commitments. Considered here are trace elements, their characterization under different categories such as toxic effects to aquatic organism, health effects, accumulation in the aquatic food chain and finally research and monitoring priorities.

Introduction

The presence of inorganic contaminants in surface and groundwater continues to be one of the most pervasive environmental issues of our time. Although control technologies have been applied to many industrial and municipal sources, the total quantity of these agents released to the environment remains staggering (Table-1). Such discharges will, in the 1990's limit the multiple use of water in many regions of the world, and potentially increase the frequency of chronic disease in the human population (Nriagu 31). In fact the annual total toxicity of all the metals mobilized worldwide exceeds the total activity of all organic wastes generated each year (Nriagu and Pacyna 32). What effect this will have on the health of future generations is not known.

Table - 1
GLOBAL DISCHARGES OF TRACE METAL
(in '000 metric tons/yr).

Metal	Water	Air	Soil
Arsenic	41	19	82
Cadmium	9.4	7.6	22
Chromium	142	30	22
Copper	112	35	896
Lead	138	332	954
Mercury	4.6	3.6	8.3
Nickel	113	56	325
Selenium	41	3.8	41
Tin	ND	6.4	ND
Zinc	226	132	1.372

Sources: Nriagu (1988), Nriagu and Pacyna (1988).
ND: No data available.

The management of inorganic contaminants will become progressively more and more difficult in future years. Scientists, engineers, technologists, and bureaucrats will need to improve both, their effectiveness dispite diminishing resources and their ability to identify timely and relevant issues. This leads to the purpose of present study: to help environmentalists control or otherwise manage inorganic contaminaion of surface and subsurface waters during an era of fiscal restraint.

Everything that man injects into the environment — inorganic, organic or biological — may finally reach natural waters. Inorganic trace elements are of special concern because they are non-degradable and, therefore persistent. Some of the heavy metals are highly toxic and can affect even in low concentrations, the aquatic life and the food-webs depending upon it, the usability of water for irrigation purposes, for industrial purposes, or as drinking water for livestock and humans. It is the task of the environmental protection agencies to check this sequence of pollution effects at different levels. The earliest and best method would be, of course, checking the problem at the source.

Trace Metals and Organic Life

It has been known for several decades that trace quantities of certain elements exert a positive or negative influence on plant, animal and human life. However, more recently, greater interest has been taken with regard to the specific role of these elements. Generally, the term trace element is rather loosely used to designate the elements which occur in small concentrations in natural biological systems. The growing public concern over the deteriorating quality of the environment has led to a generalized usage when referring to trace elements. Thus, for practical purposes, other terms such as "trace metals," "trace inorganics," "heavy

metals," "microelements" and "micronutrients" will be treated as synonymous with the term trace elements.

Table - 2

CHEMICAL COHERENCE BETWEEN LITHOSPHERE, BIOSPHERE AND HUMANS

Lithosphere %		Biosphere Y. glthectate		Humans %	
Oxygen	49.5	Oxygen	104,400	Oxygen	65.00
Silicon	25.0	Carbon	78,500	Carbon	18.09
Aluminum	7.5	Hydrogen	13,500	Hydrogen	10.00
Iron	4.7	Nitrogen	1,000	Nitrogen	3.00
Calcium	3.4	Calcium	754	Calcium	1.50
Sodium	2.6	Potassium	456	Phosphorous	1.00
Potassium	2.4	Silicon	241	Sulphur	0.25
Mangnesium	1.9	Magnesium	196	Potassium	0.20
Hydrogen	0.9	Sulphur	142	Sodium	0.15
Titanium	0.6	Aluminium	111	Chlorine	0.15
		Phosphorus	104	Magnesium	0.05
		Chlorine	99	Others	Traces
		Iron	77		
		Manganese	42		
		Sodium	38		

The core of the earth is more than 99 percent metal and of iron-nickel alloy only. The crust of the earth is one quarter metal; and seven amongst the ten most abundant elements are metals (Table 2). In the periodic table 83 elements are classified as metals, i.e. 89% of the atomic building blocks are metallic. Life has evolved amidst the lithophile elements and represent nothing but a specific structured architecture of these primary chemical bolcks. It is therefore natural that a coherence exists between the element composition of life and lithosphere, except perhaps for carbon which overtakes Si in the biospheric shell. Because of their abundance metals play great role in life and the environment. Trace metals though present in levels of part per million or less in the earth's crust are no less significant.

Trace Elements Essential to Human Life

No organic life can develop and survive without the participation of metal ions. Current research has revealed that life is as much inorganic as organic. Many metals are useful to life; for example Fe as oxygen carrier in haemoglobin, Ca and P in bone building and Mg in chlorophyll. Some heavy metals, notably Cu, Zn, Co, Cr are essential to life when present in traces and therefore are essential trace metals. They are vital in the molecular architecture of various proteins, enzymes and vitamins. However, with their increasing concentration in the environment they produces toxicty, retard growth and result in ultimate destruction (death) of the living cells. These metals are found to enter (sneak into) the living organisms because of their availability in the environmen Although these metals number about 10-15, for five of the there are international standards in drinking water (As, C Pb, Hg, Se), (Table 3). Drinking water quality criteria whic might affect public health is given in Table 4.

Table 3

TENTATIVE LIMITS FOR TOXIC SUBSTANCES I DRINKING-WATER, WHO, 1971

Substance	Upper limit c concentration, mg/
Arsenic (as As)	0.05
Cadmium (as Cd)	0.01
Lead (as Pb)	0.1
Mercury (total as Hg)	0.00
Selenium (as Se)	0.01

Trace Elements Essential to Animal Life

Presently, fourteen trace elements are believed to be essential for animal life. These are: Fe, I, Cu, Zn, Co, Mo, Se Cr, Ni, Sn, Si, F and V. A report by the World Health Organization (WHO) (1) states that "classification of the trace elements into essential, non-essential and toxic groups can be inaccurate and misleading. All the essential elements become toxic at sufficiently high intakes, and the margin between levels that are beneficial and those that are harmful may be small....it would not be surprising, therefore, if other trace elements classically regarded as toxic elements were also found to be beneficial or essential. Classification of elements according to toxicity and availability is given in Table 5.

Of the above fourteen elements, the laset five (Ni, Sn, Si, F, and V), were added in the last six years, following the introduction of better purified experimental diets.

The Non-Essential Elements

Less is known about the significance in water of the elements of the third group — about fifty stable elements which are not classified as "essential" or "toxic". Little is known about their metabolism and significance in animals and man. A ICRP report, No 23(2), summarizes balance data on 51 elements, most of which belong to this group.

Trace Elements and Aquatic Life

The rapidly increasing consumption of energy and materials and the concentration of this consumption in heavily industialized and urbanized areas has often resulted in severe pollution of the surface and even ground waters of the area. An excess of plant nutrients, particularly phosphorus, which

Table - 4

DRINKING WATER QUALITY CRITERIA FOR TRACE METALS WHICH MIGHT AFFECT PUBLIC HEALTH*

Parameter	USPHS (1962)	Japan (1968)	USSR (1970)	WHO European (1970)	WHO Intern. (1971)	SABS (1971)	NAS (1972)	Australia (1973)	USEPA (1975)	FRG (1975)
Arsenic	10	50	50	50	50	50	100	50	50	40
Barium	1,000	-	4,000	1,000	-	-	1,000	1,000	1,000	-
Cadmium	10	-	10	10	10	50	10	10	10	6
Chromium	50	50	100	50	-	50	50	50	50	50
Copper	1,000	10,000	100	50	50	1,000	1,000	10,000	-	-
Lead	50	100	100	100	100	50	50	50	50	40
Mercury	-	1	5	-	1	-	2	-	2	4
Selenium	10	-	1	10	10	-	10	10	10	8
Silver	50	-	-	-	-	-	-	50	50	-
Zinc	5,000	100	1,000	5,000	5,000	5,000	5,000	5,000	-	2,000

* As proposed by the World Health Organisation (WHO), US Public Health service (USPHS), South African Burea of Standards (SABS), Russia (USSR), USA National Academic of Sciences (NAS), Australia, Japan and Environmental Protection Agency (EPA) of the USA. All concentration in µg/1. Compiled by Hattingh (1977), except for F.R.G. data (Schottler, 1977)

Table - 5

CLASSIFICATION OF ELEMENTS ACCORDING TO TOXICITY AND AVAILABILITY

Noncritical			Toxic but very insoluble or very rare		Very toxic and relatively accessible		
Na	C	F	Ti	Ga	Be	As	Au
K	P	Li	Hf	La	Co	Se	Hg
Mg	Fe	Rb	Zr	Os	Ni	Te	T1
Ca	S	Sr	W	Rh	Cu	Pd	Pb
H	C1	A1	Nb	Iq	Zn	Ag	Sb
O	Br	Si	Ta	Ru	Sn	Cd	Bi
N			Re	Ba		Pt	

causes eutrophication, soon become easily visible. Less consipicuous is the creeping pollution caused by inorganic trace elements. Of these, the group of "toxic heavy metals" has turned out to be most important in practice.

Originally, heavy metals were those having a specific gravity greater than 5g/cm³ (33). Latter other toxic elements, some of which were not even metals, were put under this heading. Zemansky (34) included in the list of heavy metals all elements with Z > 23, except the alkalis Rb, Cr and Fr; and the alkaline earths Sr, Ba and Y. Sometimes even lighter toxic metals like beryllium are induced in "heavy metals"; here it would be better to speak of "toxic trace elements".

Mercury, cadmium, lead, copper and chromium are usually considered to be the most dangerous of all water pollutants when all factors are considered. I shall, therefore, limit this review primarily to them. Vanadium, indium, nickel, beryllium and silver are also highly toxic to the aquatic life. In the waste water of metal works, the heavy metals have been put in following order of decreasing risk, all factors (use, solubility, toxicity etc.) considered; Cd > Ni > Cu > Zn (35). Many other elements are highly toxic, but fortunately, most of them are so rare (and expensive), for instance, the noble metals and the lanthanides, that they are unlikely to exist in waters in harmful concentrations.

Mercury

Mercury, with an average crystal abundance of 0.08 mg/kg, occurs in sedimentary, igneous, and metamorphic rocks. The most important sources are cinnabar (HgS), but there are at least another 30 common ores and minerals that contain mercury in relatively high concentrations. Mercury, undergoing complex chemical reactions in the environment, forms a number of highly toxic organic derivatives. These compounds have been implicated in adulteration of aquatic resources in numerous countries. (Table 6 gives the amount of Hg in river water and rain).

All mercurials are highly toxic to plants, both marine and freshwater, Growth inhibition of the green algae *chlorella vulgaris* and the blue green algae *Anabaena feocs-aquare* has been observed following exposure to methymercuric chloride in the 0.001 to 0.01 mg per litre range (reviewed by US Environmental Protection Agency, 1984).

Most species are less sensitive to inorganic Hg; Mora and Fabregas (1980) reported that the minimum toxic concentration of $HgSO_4$ was 0.15 — 0.209 mg Hg/l. Organic Hg is

Table - 7

TOXICOLOGICAL TOLERANCE LEVELS OF SOME METALS AND COMPOUNDS IN mg/l

Element/compound	Biologic purification*	Self puri-cation*	Crustacean**	Fish**	Mammal**	Man**
Al $(SO_4)_3$			136	1.8 (trout)	12 g/kg	
Ag-compounds			0.01 - 0.03	0.003 - 0.01		0.05 mg/l (chron)
As-compounds	> 0.7		4 - 9.1	1 - 23	2 - 1[illegible] mg/kg	2 mg/kg (0.05 mg/l chron)
$BaCl_2$	1000		83 - 1500	0.15 - 8.3 g/l	30 [illegible] mg/kg	3.3 - 8.3 mg/kg
$BeSO_4$ (Be)				1.13 (sunfishes) 0.02 (others)		
H_3BO_3				1 - 10 g/l	1 [illegible] g/kg	5 - 20
$CdCl_2$ (Cd)	1 - 5	0.1	0.03 - 4.0	3.0 (trout)	0.[illegible].15 mg/kg	5[illegible] - 5[illegible] mg/kg
Co-compound (Co)		5	(0.5) protozoa	0.01 - 0.1	0.7 [illegible] 5 g/kg	50 - 5[illegible] mg/kg
Chromate [Cr(VI)]			0.3 - 0.7	0.015 - 0.195	0.4[illegible]1 mg/l chron	0.5 - 5 g/kg
$Cr_2(SO_4)_3$ (Cr)	2 - 5	0.3	0.03 - 0.1	1.2 - 200		
$CuSO_4$ (Cu)	1	0.01	0.08 - 0.8	0.03 - 0.8 (trout)	(8 g)	(8 g)
$FeSO_4$ (Fe)	> 35	Fe-deposit	1.62 - 152	0.9 - 152	0.5 - 5 g/kg	0.5 - 5 g/kg
$HgCl_2$ (Hg)		0.018	0.03 - 0.1	0.15 - 0.25 (trout)		
Mn-compounds (Mn)			0.5 - 1 g/l	0.05 - 1.2 g/l		0.5 - 5 g/kg
Ni-compounds (Ni)	6	0.1	0.0055-1 g/l	0.8 - 55		50 - 500 mg/kg
$Pb(NO_3)_2$ (Pb)	5		3 - 170	0.33 - 200 (trout)	2 g/kg	
Se-compounds			(183) protozoa	2 - 10.5	(5 - 10 mg/l chron)	(0.01 mg/l chron)
Sn-compounds				2		
$ZnSO_4$ (Zn)	1 - 3	0.1	19.4	1 - 5 (trout)	1.9 - 2.2 mg/kg	

* Data after Liebman, 1958.

** Data after Jung, 1973, and the Hygiene-Institute des Ruchregebis, Gelsekirchen.

Table 6
HEAVY METALS IN RIVER WATER AND RAIN, μG/L

	Hg	Cd	Pb	V	Cr (VI)	Cu	Zn	Co	Mo
River water Filtered (0.45 μ) Global average, (Turekian 1972 (22)	0.002	?	3	0.9	1	7	20	0.1	0.6
Rain water, Unfiltered, Annual average Wray Mires, U.K. 1974 Peirson & Al 1973 (23)	0.02	17	-	4.1	2.9	23	85	0.25	-

considerably more toxic to fish, both marine and fresh water, than inorganic Hg. One of the earliest reports (Wobeser, 1975) indicated that the 24-h median tolerance limit of fingerlings to rainbow front on courhynchur mykiss to methyl mercuric chloride was 0.125 mg/L. Numerous other studies (reviewed by Mance, 1987) have placed the acute LC50 of inorganic Hg and organic Hg to both marine and freshwater fish in the 0.1-1.0 mg/l and 0.01-0.1 mg/L range, respectively.

Any group of people who eat large amounts of fish, such as native Indians, are potentially susceptible to methyl Hg intoxication. Analysis of mercury levels in blood and hair is widely used for populations at risk (Canadian Environmental Control Newsletter, 1986). Tamashiro et al. (1987) used such techniques in evaluating the health of residents of five coastal towns in Japan. It was found that, although mercurry levels in hair were three to six times greater than those of controls, there was no concomitants on life span. In a similar study, Valciukas et al. (1986) demonstrated that Mohawak Indians in New York state carried relatively low levels of mercury in their hair and blood, despite the consumption of large amounts of fish. (Table 7, gives the toxicological tolerance levels of mercury).

Acute mercury poisoning is usually characterized by pharyngitis, abdominal pain, nausea, vomiting, bloody diarrhoea, and shock. Nephritis, anuria, and hepatitis occur, followed by death from gastrointestinal and/or kidney lesions.

Lead

Presently, the technological sources inject lead into the atmosphere at about 100 times the natural rate (3). Atmospheric fallout is an important mode of addition of lead to surface waters. Traffic, smelters and incinerators are the three main sources of atmospheric lead pollution. Lead concentrations in natural waters are presented in Table 8.

Rivers running through industrial regions can contain as much as 120 microgram Pb/L (8). The Rhine brings into the North sea annually 2000 tons of lead, while the estimated atmospheric fallout in North sea is 1000 tons/year (10). The bulk of lead in surface water is particle bound. It is relatively 1-200 mg Pb/kg (11). The lead concentration in sediment is usually 3 or 4 orders of magnitude higher than in water.

Table - 8
LEAD IN WATERS

Kind of water		Author	Year	Ref.
Ocean	0.09	Tatsumoto & Patterson	1963	4
Coastal, Unpoll	1.7	Abdullah & Royle	1972	5
River water	3	Wuhrman	1974	6
Rain	34	Lazrus et al.	1970	7
River, Polluted	120	Bowen	1976	8
Sewage	200	Mytelka et al.	1973	9

Lead is toxic for aquatic organism, but less so than cadmium and mercury (Revera, 12). It is usually particle bound. Fish avoid water containing 0.3 mg Pb/1 (13) and above 1 mg/1 is lethal (12). Such concentrations are usually possible only locally. Aquatic animals can hardly accumulate so much lead that their meat would become dangerous to eat, except some shellfish. Where lead pipes are used, tap water may exceed the tolerance limit 0.1 mg/1.

I consider lead the most dangerous heavy metal pollutant to mankind, but mainly as an air pollutant. Of the three main sources, smelters, incinerators and leaded gasoline, the first two should be rapidly stopped if necessary, by closing those units which cannot be provided with filters. Lead in gasoline should be reduced at a pace which is technologically possible. The aquatic releases should be controlled, considering the cost/benefit ratio. Lead is not enriched in the aquatic load chain.

Cadmium

Cadmium is the 64th most abundant element, occurring in the earth's crust at an average concentration of 0.2 mg/kg. Cadmium is classified as soft acid, preferentially complexing with sulfides, often as greehockite (a hexagonal crystalline form of cadmium sulfide). Cadmium is of considerable environmental and health significance because of its increasing mobilization and toxicity to many life forms. Worldwide anthropogenic input of cadmium to freshwater is given in Table 9.

Table 9

WORLDWIDE ANTHROPOGENIC INPUT OF CADMIUM TO FRESH WATER

(thousand metric tons/yr)

Source	Input
Atmospheric deposition	0.9-3.6
Smelting and refining of non-ferrous metals	0.01-3.6
Manufacturing processes	
Chemicals	0.1-2.5
Metals	0.3-1.2
Domestic wastewater	
Central	0.2-1.8
Non-central	0.3-1.2
Discharge of sewage sludge	0.1-1.3
Steam electricity production	0.01-0.24
Base metal mining and dressing	0-0.3
Total Input	**2.1-17**

Source: Nriagu and Pacyna (1988)

Cadmium and, in particular, the free cadmium ion are highly toxic to most plant and animal species. The effective concentration for duck weed *Lemna minor* is only 0.2 mg/l, compared to 0.45 mg/l for nickel and 1.1 mg/l for copper (Wang, 1986). Acute and chronic toxicity to aquatic plants is ameliorated by changing pH and the concentration effect of the availability of free cadmium ion (Campbell and Stockes, 1985). Similarly, marine algae are generally much more tolerant of cadmium than freshwater species, owing to the binding of the free cadmium ions with chloride.

In humans, acute exposure to cadmium leads to nausea, vomiting, salivation, diarrhoea, and muscular cramps (US Environmental Protection Agency 1980). Severe to fatal cases may show the following symptoms: liver injury, convulsions, shock, renal failure, and cardiopulmonary depression.

Renal toxicity, such as proteinuria is the most common symptom of chronic exposure to cadmium. Renal dysfunction is likely to be displayed in 10% of the population at concentrations of 0.18-22 mg cd/g renal cortex. Any individual with a tissue residue in excess of 0.285 mg/g usually suffers from renal dysfunction. (Scott et al, 1987). In human kidneys from United Kingdom it was found that maximum cortical residues, 0.02 mg/g, occurred in 50 to 59 years old, followed by those in 60 to 69 and 40 to 49 year old categories. In addition, heavy smokers had about 33% more cadmium in their kidney than non-smokers. Nogwa et al. (1968) reported that Cd residuals in 173 autopsied Japanese reached 0.02 mg/g in the kidney cortex. These individuals came from a highly polluted area and showed kidney damage on autopsy.

Chromium

Chromium is one of the least toxic of the trace elements on the basis of its over-supply and essentiality. Generally mammalian body can tolerate 100-200 times its total body content of Cr without harmful effects. Chromium (VI) compounds are approximately 100 times more toxic than Cr (III) salts. The stomach acidity leads to reduction of Cr (VI) to Cr (III) of which gastrointestinal absorption is less than 1%.

ACCUMULATION OF TOXIC SUBSTANCES IN THE AQUATIC FOOD CHAIN

The Minamata bay disaster during the early 1950s saw a mysterious neurologic illness with human fatalities among fisher folk who subsisted mainly on fish. Since this disease also prevailed among local sea birds and household cats, investigations led to the discovery that the consumption of high concentrations of mercury compounds accumulated in fish and shellfish had evoked disastrous end-effects in the nutritional food chain (Goldwater, 1971). After unravelling the cause of the mysterious "Minamata illness," society suddenly became aware of the existence of toxic metals in the environment.

Moreover, this awareness has led to further research which is still in progress at various centres, with regard to the accumulation of toxic substances in the food chain.

A typical biologic food chain is depicted in Figure 1 (from Hartung, 1972). Decay of organic material in the aquatic environment possibly enriched by the disposal of sewage and industrial effluents — together with detritus formed by natural wealthering processes — provides a rich source of nutrients in both the bottom sediments and to the overlying water body. Microorganisms and microflora ingest these nutrients into their living cells from these supply sources. Subsequently, men consuming the fish, inevitably suffer from the results of an enrichment having taken place at each trophic level i.e., where less is excreted than ingested.

Environmental Priorities for Trace Metals

Environmental pollution, particularly elucidation of the subtle, chronic effects of the numerous trace pollutants is a

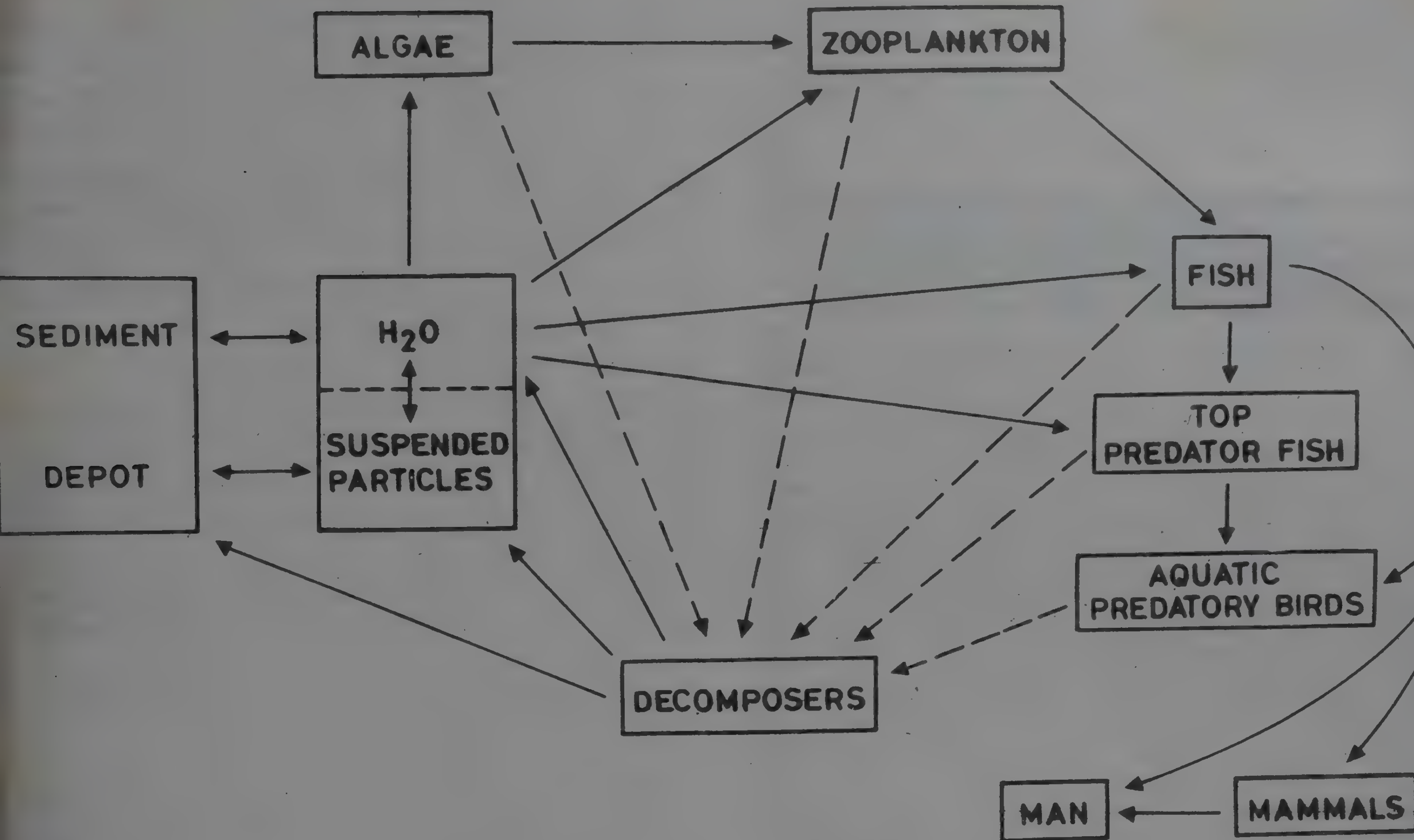

Fig. 1: Food chain model for mercury (Hartung, 1972)

challenge to our advanced society. Heavy metals are usually close to the top of the lists of priorities. Perhaps the most important task would be: to gain more basic knowledge of the interplay of trace elements at the cellular level and the identification of the enzyme systems involved, by simple experiments. The priorities which should be given for the study of trace metals should be as follows:

1. Determination of the chemical forms of metal pollutants in air, water, food and soil. Study of the mechanisms of absorption and factors which may affect this.

2. Effect of metal ligand binding to proteins on metal transport accross biological membranes.

3. Determination of metal contents in critical organs: correlation of toxic hazard with metal content in biological fluids.

4. Development of methods to serve as indicators of subclinical or early toxicological changes, and methods for epidemiological surveys of metal toxicity. Studies on mutagenesis, carcinogenesis, embryotoxicid and teratogenicity of metals.

5. Accumulation of dose-response data and studies of chronic low-levels exposure.

6. Studies on the pathogenisis of metal toxicity, correlation of tissue, and cellular and sub-cellular concentration of the metal with toxicity. Studies on the biochemistry and molecular pathology of metals and the displacement of physiologically functional metals by toxic metals.

7. Studies on toxic interaction between different metals and between metals and organo-halogen compounds in living organisms.

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Stabilisation of Hazardous Wastes by Chemical Fixation & Solidification*

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Introduction

Until recently, most of the waste generated in Australia was disposed of in either secured or unsecured landfills. Much of this included hazardous solids and liquids with a propensity to leach toxic metals and/or compounds into aquifers and water courses.

Today, with the realisation that these disposal techniques are causing pollution of our water resources, regulations governing the disposal of hazardous wastes have tightened, and many state governments have set up waste management bodies to better control the production and disposal of hazardous wastes.

This paper will critically discuss the current practices in Australia with respect to the disposal of hazardous wastes, and review one of the new technologies being developed to render hazardous waste non-harzardous — chemical fixation and solidification.

Table 1
HAZARDOUS WASTE GENERATION IN AUSTRALIA

Waste Type	Description	M Litres/Year
A	Plating	4,491
B	Acids	31,025
C	Alkalis	33,013
D	Inorganic Chemicals	7,090
F	Paints, Organic Sludge	25,688
G	Organic Solvents	14,432
J	Aqueous Oily Waste	84,210
K	Textile	9,750
L	Pesticide	46,000
M	Waste Waters	26,130
N	Inert Slurries	

The data does not include mining wastes and radioactive wastes. These are handled by different management systems.

Hazardous Waste Generation in Australian Cities

The major types of hazardous waste are listed in Table 1, together with the approximate quantities generated per year.

* Text of the paper presented at the "HAZPAC '91", Cairns, Australia, in April, 1991.

The data only applies to the cities Adelaide, Brisbane, Melbourne, Sydney and Perth. (Sources: Maunsell Pty Ltd., 1990, and O'Gallagher, 1990).

The Legislative Framework

Australia has three tiers of government — Federal, State and Local. In general, hazardous waste management is the responsbility of the State and Local authorities.

Local governments are normally responsible for ensuring the proper collection and disposal of wastes. If hazardous wastes are involved, then the State government usually becomes involved. They tend to control the production, storage, transport, treatment and disposal of hazardous wastes. Wastes discharged to sewers, or the atmosphere, are normally excluded as they are covered under different legislation (e.g. water resources and clean air Acts).

At present, there is no intractable waste incinerator in Australia, although a joint government task force has recommended the establishment of such a facility in south-eastern Australia. Until such a facility is built, intractable wastes are being stored or exported to facilities overseas.

Other types of hazardous waste are usually stored in government-operated secure landfill sites. However, the life of these sites is limited and governments are giving notice that in the near future, hazardous wastes will need to be converted to a form which will allow their disposal at alternative unsecured landfills.

New South Wales

In order to extend the life of the only secured landfill in the Sydney area, the Waste Management Authority has placed restrictions on the input of wastes to the sites. Much hazardous waste, called *special waste*, must now be treated to allow its disposal at an unsecured landfill site. This implies that much waste must now be chemically fixed and solidified prior to disposal.

Once treated, the waste must undergo a leach test by an approved laboratory. The Toxicity Characteristic Leach Procedure (TCLP), a standard test developed by the United States Environmental Protection Agency (USEPA), is recognised by the New South Wales Waste Management Authority.

Victoria

In 1986, the State Government adopted a comprehensive strategy for the management of industrial wastes. The strategy required that heavy metal wastes containing arsenic, mercury, cadmium and/or selenium be chemically fixed and solidified prior to disposal and landfilling of liquid industrial wastes be phased out.

The landfilling of industrial wastes ceased in 1987 when the government established a waste solidification plant to complement the private sector facilities. The temporary government plant would close when the private sector could meet the industry demands for chemical fixation and solidification.

The Victorian government at present use the Extraction Procedure (EP) toxicity test, also developed by the USEPA, to classify hazardous waste and test solidified waste products. (Templeton and Van Rooyen, 1990).

Queensland

A Waste Management Unit exists within the Department of Environment and Heritage. The task of this unit is to develop policies and strategies in the areas of recycling of wastes, waste minimisation and waste treatment. Most of the day-to-day management of industrial and hazardous waste in South-Eastern Queensland is undertaken by the Brisbane City Council and the Department of Health.

The Brisbane City Council runs a hazardous waste treatment facility at Willawong for the treatment and disposal of hazardous wastes. No secure landfill exists in South-Eastern Queensland. The Toxicity Characteristic Leaching Procedure (TCLP) is used to classify hazardous wastes, whereas the TCLP and a pH 5 sulphuric acid leach test are used to test solidified waste products. Both fly ash-cement and cement-based processes are used to immobilise wastes by micro-encapsulation or chemical fixation.

A new hazardous waste treatment facility is presently being designed to replace the Willawong plant. The treatment of wastes will not change, but the processes will be upgraded to meet the new, stricter environmental guidelines.

South Australia

The South Australian Waste Management Commission was established in 1979 and its powers increased under the Waste Management Act (1987).

There is no secure landfill in this state, but a recently published review undertaken for the Waste Management Commission (Maunsell Pty Ltd., 1970) has recommended the establishment of such a facility.

Two privately-owned treatment plants accept most of Sou Australia's hazardous waste for treatment and disposal. The facilities utilise chemical fixation and solidification techno ogy. All solidified wastes at present are required to pass th EP toxicity test. The TCLP test will probably be adopted the near future.

Waste solvents and residues are incinerated in Victoria an intractable wastes are exported to the United Kingdom fo treatment.

Western Australia

Western Australia is perhaps lagging somewhat behind th other States in the control of hazardous wastes.

Day-to-day hazardous waste management is controlled b the Environmental Health Branch of the Health Departmen Recently a Hazard Waste Management Unit has also bee established with the Department of State Development, a a focus for industry and to establish an inventory of hazar dous waste to permit more effective control and disposal

Liquid and solid hazardous wastes are treated at a privatel owned treatment facility. Since 1989, all waste producers hav been required to treat their waste to render it non-hazardous (Davis, 1990).

What is Chemical Fixation & Solidification?

Chemical fixation and solidification processes (CFS) ar designed to address the long-term disposal of wastes tha cannot be recycled or further reduced in volume. The pro cess involves converting the liquid, sludge or solid waste int a structurally sound solid material which can be used for lan reclamation or other purposes. The process aims to not onl bond the waste in a solid matrix of low permeability, but als to *chemically fix* the hazardous substances so that they ar immobilised. This latter process may involve chemical pre cipitation, chemical adsorption, diodochy or in some case physical encapsulation.

The process may be applied to both inorganic and organic wastes, although the former have been more successfull treated than the latter.

Types of CFS Processes: Organic Processes

Organic CFS processes aim to encapsulate the waste in an inert organic polymer matrix, which can be either a thermoplastic resin or a cross-linked polymer.

Thermoplastic Systems

The main thermoplastic material used is bitumen. It can be used to treat either organic or water-based wastes. For

organic wastes, the volatiles must be collected for recycling or destroyed by incineration, whereas water-based wastes must be dried before treatment. This system is used in the United States to treat radioactive wastes. Although effective, it is an expensive process and hence its use is limited to small quantities of highly hazardous waste material.

Cross-linked Polymer Systems

These systems can also be used for both organic and inorganic-based wastes, although water can "weep" in the latter systems. In the treatment process, the waste is blended with a mixture of monomers, then polymerised by the addition of a catalyst. Because the catalysts used are often strongly acidic, these processes are not recommended for metal bearing wastes (McFarland, 1988). A wide range of polymer types can be used including urea-formaldehyde, polybutadiene, polyester-epoxy, acrylamide, polyolefin and polyurethane. They are mostly used for treating organic wastes such as hydrocarbons, chlorinated hydrocarbons, PCB's, pesticides etc.

The main advantage of polymer systems is that the same system can be applied to a wide variety of wastes, since there is usually no direct chemical interaction between the polymer and the waste. In other words, the wastes are solidified but usually not chemically fixed. The product is resistant to most aqueous solutions and waste remobilisation is usually low.

The main disadvantages of organic systems are the high costs and the generally difficult working conditions. They are little used except on some wastes which cannot be incinerated.

Inorganic Processes

Inorganic CFS processes have generally enjoyed much more success than the organic systems. They are used to treat mainly inorganic wastes, although a certain amount of organic material in the waste can be tolerated (e.g. oil and sludge).

The processes use a variety of cementitious reagents (such as Portland cement, sodium silicate, flyash, kiln dust, gypsum, clays) to both chemically fix and encapsulate the waste in a solid cement-type matrix. The processes are usually named after the main reagents used. Some of the more common of these processes are discussed below:

Portland Cement

Portland cement processes are very important and widely used in chemical fixation and solidification. This is because cement technology is well uderstood, the product is readily available and consistent in quality, and a final product of consistent quality can be readily produced.

During the setting and hardening of the cement, many toxic metals can be immobilised by reaction with the cement components. Some metals, such as lead and chromium (III) appear to form silicates, whereas others (cadmium, zinc) form hydroxides. Whereas the latter are eventually leached from the cement matrix as the internal pH drops, the former remain firmly bound.

Some toxic substances, such as arsenic and chromium (VI), exist as anions under the conditions of the solidification reaction and are not chemically fixed. For these metals, a prior fixation step is required before solidification. For example, arsenic may be immobilised as ferric arsenate, whilst chromium (VI) may be reduced to chromium (III).

The final solidified product may vary from a monolithic concrete mass through to a granular material or powder, depending on the process requirements.

Portland Cement - Soluble Silicate

It has long been known that soluble silicates reduce the leachability of toxic metal ions by the formation of low solubility metal oxide-silicates which encapsulate the metal ions in a metal silicate-gel matrix. This is the basis of the Portland cement-soluble silicate processes.

The main use of this process is in the treatment of wastes containing large amounts of water where dewatering prior to treatment is not possible. This process ensures quick gelling of the entire mass which is then allowed to harden by the much slower cement setting and hardening reactions. The initial gelling reaction is a delicate process and depends on the correct ratio of calcium to silicate ions and the correct mixing technology (Conner, 1990).

Portland Cement - Flyash

Flyash has been used as an additive to cement for many decades. It imparts many desirable properties to concrete including reduced water requirement, reduced heat evolution which leads to less cracking, and reduced permeability. This will mean reduced leachability of encapsulated metal ions as opposed to Portland cement alone.

The main disadvantage is the extra mass and volume of the solidified product compared with the Portland cement system.

Flyash - Lime

Without doubt, more waste has been treated by this process than any other. Flyash from coal burning power plants

is often solidified by treatment with lime.

The reactions between lime and flyash to produce a solidified product are generally the same as those occurring in Portland cements. They are, however, much slower, dependent on the flyash used and generally produce a weaker product.

The leachability of metals is also higher than in cement-based systems, probably due to the higher pH which resolubilises metals as hydroxo complexes. However, these processes can accommodate larger quantities of organics (> 20%) than other systems and their major use is in this area.

Comparison of Inorganic Processes

Physical Properties

The physical properties of solidified products can vary depending on requirements. Rock-hard solids are not always most desirable, however low permeability is, as it will limit leachability.

The ranges of some physical properties reported in the literature are listed below (from Conner, 1990).

Table 2

PHYSICAL PROPERTIES OF SOLIDIFIED WASTE

Bulk Density (g/cm^3)	0.7-2.2	Permeability (m/s)	10^{-6}-10^{-10}
UCS* (kPa)	75-25,000	Freeze-Thaw Cycling	1-12 Cycles
Water content (%)	0.9-64	Wet-Dry Cycling	1-12 Cycles

* UCS: Unconfined Compressive Strength.

Chemical Properties

Cote (1986) used a dynamic leaching procedure (discussed later) to compare the leaching of four toxic elements (arsenic, cadmium, chromium and lead) by four different chemical fixation/solidification processes. His results indicated that:

* Portland Cement-Flyash performed best for all metals
* Portland Cement-Soluble Silicate performed the worst (except for lead)
* Portland Cement-Clay and Flyash-Lime were intermediate, except for lead, where they were both poor.

Another study funded by the USEPA (Weitzman et. al., 1988 as reported in Conner, 1990), indicated that:

* For high metal content wastes, only Portland Cement proved acceptable.
* For low metal wastes containing lead, lime-flyash was t best.

These results indicate a very important point about chen ical fixation/solidification systems - no one system is the be for every waste. Each system has its strengths and weakness and these must be assessed before selecting a particular tecl nology for a particular waste.

Testing of Solidified Waste Products

There are, at present, no standard tests and procedures fo testing and predicting the performance of chemically fixe and solidified waste products. However, a recently complete study carried out by Environment Canada, in conjunction wit the USEPA, Alberta Environment, and 15 industrial com panies involved in developing of marketing solidificatio technologies, has examined a range of tests and found ther to be suitable for evaluating the properties of a wide rang of solidified wastes. The results of the study are summarise in the journal Waste Management (Stegemann and Cote 1990).

The test procedures investigated were:

* Physical Tests - Bulk Density, Specific Gravity, Wate Content, Hydraulic Conductivity, Unconfined Compres sive Strength (UCS), Freeze-Thaw Weathering, Wet-Dr Weathering.
* Chemical Tests - Equilibrium Extraction, Toxicity Charac teristic Leaching Procedure (TCLP), Acid Neutralisatior Capacity, Sequential Chemical Extraction, Dynamic Leacl Test.
* Micromorphological Tests - X-ray Diffraction (XRD) Scanning Electron Microscope (SEM), Energy-Dispersive X-ray Analysis (EDAX), Optical Microscopy.

An interesting result of the study was that the TCLP test, an 18 hour acetic acid leach, which is a regulatory test used by the USEPA to assist in waste classification, and being seriously considered throughout Australia for the same purpose, produced a poor precision value indicating at least four replicates would be required to produce a reasonable result. In contrast, the Dynamic Leach Test, a 9 day distilled water leach including leachant renewal, produced excellent reproducibility and allowed observation of clear differences between solidified products. Only one such test is required.

Perhaps, the Dynamic Leach Test, which appears to produce a clearer indication of the leaching characteristics of a waste product in a single test, and is also applicable to the modelling of the long-term leaching behaviour of hazardous

waste products, may be worthy of more detailed consideration by our regulatory authorities (Cote et. al., 1984, Bridle et. al., 1987).

Research and Development

A limited number of institutions throughout Australia have on-going research and development programmes in the area of hazardous waste stabilisation. These are listed in O'Gallagher (1990) and include the Australian Nuclear Science and Technology Organisation (ANSTO), the CSIRO Division of Coal and Energy Technology, the University of New South Wales, the University of Queensland and Australian Metallurgical and Mineral Testing Consultants Pty Ltd. (AMMTEC).

Ammtec, together with Campbell Environmental Ltd., has recently received a grant from the Western Australian State Government, through the Minerals and Energy Research Institute of Western Australia (MERIWA), and a number of industry sponsors to develop technologies for the long-term disposal of hazardous wastes by solidification which are suitable to Western Australian conditions. The project also involves evaluating the physical and chemical testing procedures outlined above, and where appropriate, modifying or changing them to better suit the disposal conditions in Western Australia.

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News from Abroad

LONG RANGE FORECASTS FOR GLYCERINE IN US IS GLOOMY

Glycerine price increases are likely, given the current tightness in the U.S. market, according to Colin A. Houston & Associates, Inc. (CAHA), a consulting firm in Mamaroneck, New York. "But as new glycerine sources are brought on stream, glycerine availability will improve rapidly, forcing prices well below current levels", says Christopher Houston, project leader for a world polyol study CAHA is conducting. He points out that except for temporary fluctuations, the price of glycerine has steadily declined, from a level of 90-94¢/lb in 1985 to as low as 35-40¢/lb in early 1992.

While glycerine prices have recently been firming, there is little hope for a sustained reversal of the downward trend, since natural glycerine production will continue to increase as new fatty alcohol plants come on stream in Asia, Europe, and the U.S. Significant new sources of glycerine are also likely to develop, including bio-diesel fuel and sucrose polyesters.

Bio-diesel, a petro-diesel substitute from rapeseed, canola oil, or soya, is being touted as the "natural" alternative to regular diesel. It continues to gain momentum in Europe despite the fact it requires government subsidies.

Besides being biodegradable and made from renewable resources, bio-diesel is apparently cleaner burning and gives no sulfur emission. This is particularly notable in view of tightening Clean Air Act Standards and has prompted U.S. field trials in mass transportation in south Dakota following similar programs in several European countries.

Other tests are planned in Barcelona this year during the Olympic Games. In addition, the fact that it provides a new market for farmers is probably most crucial and has provided significant vocal proponents of the program.

About 250,000 tons of bio-diesel capacity is slated to be on stream by the end of 1993, yielding approximately 25,000 tons of glycerine. While this may represent only 4 to 5 per cent of the total glycerine market, the amount is still very significant.

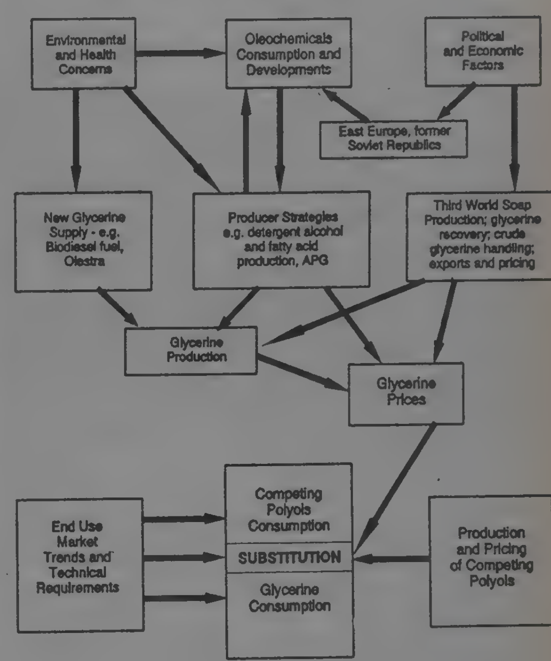
Surcrose polyesters are fat substitutes derived from natural materials which yield glycerine as a by-product. A well-known example is Olestra®, a product developed by Procter & Gamble, which is currently awaiting FDA approval. The possible non-renewal of P&G's patents on Olestra®, due to expire in 1994, could speed up commercial use once FDA approval is granted.

The problem is that only a few glycerine markets have developed over the past 10 years. Anti-plaque mouthwashes, oilfield drilling fluids, and laundry detergents have yielded some additional outlets, but the bulk of glycerine consumption is in slow growth markets (under 2 per cent per year).

Without any real potential for new usage, glycerine supply in the 1990s may greatly exceed consumption, threatening a price collapse. Substitution into markets for other polyols such as pentaerythritol, trimethylolpropane, propylene glycol, and sorbitol is foreseen.

CAHA's new study will examine the global markets for glycerine and its main polyol competitors. It will include comprehensive regional market data for each polyol and end use, and will analyse the factors affecting choice of polyols. "The situation is very complex", says Christopher Houston. "You can't just look at growth rates for traditional end uses. We are developing scenarios for glycerine production and pricing and the subsequent substitution potential for the polyols. The factors impacting the glycerine market are environmental and political, as well as economic and technical". (See diagram)

INTERDEPENDENCE OF OLEOCHEMICALS, GLYCERINE AND OTHER POLYOLS



Profiles of major polyol producers and their strategic options and priorities will also be included in the study. Further details are available from Colin A. Houston & Associates, P.O. Box 416, Mamaroneck, NY 10543 USA.

GLITSCH TECHNOLOGY CORP. AND PETROCEL TO COLLABORATE ON DMT PROCESS IMPROVEMENTS

Glitsch Technology Corporation (GTC) and Petrocel, S.A. have signed a cooperative agreement to develop and market improvements in dimethyl terephthalate (DMT) process technology. GTC is the unit of Glitsch Incorporated focused on the development of chemical separations technology. Petrocel, one of the world's largest producers of DMT, is a member of the Grupo Industrial Alfa of Monterrey, Mexico. DMT is one of two major feedstocks for polyester production, but it has become

an orphan technology since Dynamit Nobel A.G. and Hercules discontinued development and licensing of the technology. The GTC and Petrocel partnership will fill this gap by supplying new technology focused on increasing yield and reducing energy consumption.

Francisco Garza, President of Petrocel, noted that "DMT is a stable business, and a mature product. The only way to increase productivity is with breakthrough technology that will insure the long-term competitiveness of DMT". The president of Glitsch, John Van Buren, points out that "This cooperative effort affords us a vehicle to rapidly move breakthrough technology into the marketplace and provide DMT producers with an additional measure of process efficiency and productivity".

Work on DMT processing improvements will be done at Glitsch's research centers in Texas and Montana, with GTC and Petrocel sharing developmental costs. GTC will provide basic engineering and startup services for the new technology, while Petrocel will construct the first demonstration units at its world scale Altamira, Mexico plant. For more information concerning new DMT process technologies, contact Glitsch Technology Corporation at P.O. Box 660053, Dallas, Tx., USA.

FRANK POPOFF RECEIVES CMRA AWARD FOR EXECUTIVE EXCELLENCE

Frank Popoff, president and chief executive officer of The Dow Chemical Company, received the CMRA Award for Excutive Excellence on May 5 in New York City. This award is presented annually by the Chemical Management & Resources Association (CMRA) in recognition of distinguished accomplishments involving marketing management, business development, planning, business intelligence and marketing research in the chemical and allied process industries. The award was presented to Popoff during the association's annual Review and Forecast Conference. According to Roger E. Shamel, president of CMRA, "Frank Popoff was chosen for his significant contributions, as a spokesman for the chemical industry, and for the success of his strategic vision at Dow. His vision has allowed Dow to become a global company with leadership positions in basic commodity chemicals, while expanding its position in performance speciality chemicals and the related allied industries".

As recipient of the award, a grant of $4000 was given by CMRA in Popoff's name to Indiana University. Popoff has been president and CEO of Dow since 1987 and a member of the Board of Directors since 1982. He joined Dow in 1959 after receiving a bachelor's degree in chemistry and MBA from Indiana University. He served in a variety of sales, technical and management positions in the United States and Europe. He became president of Dow Europe in 1981 and in 1985 was named executive vice president of Dow and a member of executive committee. He is a Director of American Express Company, Chemical Financial Corporation, Dow Corning Corporation, Marion Merrell Dow Inc. and the Chemical Manufacturers Association.

Other awards

CMRA recognized the author of the best paper of the year and honored two outstanding members at its annual meeting at the Marriott Marquis in New York City, May 5th, 1992. This year's winner of the best paper of the year award was Gerald S. Adolph of Booz Allen & Hamilton for his paper, 'The chemical industry competing in the new world order'. This paper was presented at CMRA's September, 1991 meeting, held at The Greenbrier in White Sulphur Springs, WV.

DU PONT'S ACQUISITION OF ICI'S NYLON BUSINESS TO BE PROBED

The European Commission is to investigate the proposed acquisition b Du Pont, the US chemicals company, o Imperial Chemical Industries' nylo business because the deal may disto competition in the market for nylo carpet fibres.

The investigation will take up to fou months and follows a four week preli minary injury. Both companies hav said they were confident that the com mission would eventually allow the transaction to go ahead. ICI said "While not unexpected it is unfortunate It will add to the uncertainty felt b employees and customers.

The sale is part of an agreement made in April in which ICI would receive £250m ($ 450m) in cash and Du Pont's acrylics business in exchange for it nylon operations.

The agreement called for the deal to be completed by the end of the year. IC said this was still the target. However if the commission is still not happy about the agreement after its four-month inquiry, it could outlaw the deal or ask the companies to amend it, for example by selling overlapping parts of the business.

Since EC merger regulations came into force in September 1990, 93 deals have been notified to the commission's merger task force, of which only six have gone into the second-phase four-month inquiry. Of those six, only one, last year's Franco-Italian bid for De Havilland, the Canadian aircraft-maker — has been blocked outright.

US anti-trust regulators open inquiries this month. If the deal does go ahead, Du Pont would become the largest manufacturer of nylon in western Europe, with 30 per cent of capacity.

Its main European competitor would be the new 50:50 joint venture between Rhone-Poulenc of France and Snia of Italy, with about 25 per cent of capacity. The industry has been forced to

consolidate because nylon sales have been hit by the world slowdown in construction — most is used in carpets. However, its problems go back to the early 1970s, since when it has lost market share especially in clothing to another artificial fibre, polyester.

ICI nylon operations have sales of about £600m annually and 6,100 employees in the UK, Germany and the Netherlands. By swapping nylon for acrylics, ICI distances itself from the textiles industry and concentrates on mainstream chemicals.

BRISTOL-MYERS FORECAST DEPRESSES DRUG SHARES

Shares in Bristol-Myers Squibb, the world's third largest pharmaceuticals company, plunged by about 10 per cent after the US group warned of only a "mid-single digit" earnings advance in the second quarter and of sales growth totalling less than 5 per cent.

The company blamed inventory reduction by wholesalers. However, analysts said Bristol-Myers had also been affected by increasingly high levels of discounting imposed by managed healthcare groups. These groups, often containing insurance companies, have been insisting on lower prices for drugs.

The warning hit other drugs company stocks on both sides of the Atlantic. Pharmaceuticals companies have been warning for some time about increased discounting in the US. One UK-based group complained Wall Street analysts were only just recognising the extent of the present pricing environment.

In addition to discounts to managed groups, companies have been forced to offer rebates to Medicaid. Last year SmithKline Beecham paid back $ 50m, while Galxo paid $ 55m during the first half of this year. In a formal statement Mr. Michael Autera, Bristol-Myer's chief financial officer, said that wholesalers' stocks of the company's pharmaceutical products were "being reduced to lower levels than previously anticipated — in some instances below historical norms."

Bristol-Myer's first-quarter revenue growth — only 2 per cent — had already disappointed analysts. When the results were released, this was blamed on heavy "pre-buying" of drug products last autumn, ahead of anticipated prescription drug price increases. Wall Street pundits had, however, expected sales growth to pick up in the second quarter.

PLATINUM PRICES LIKELY TO RECOVER SOON

The world platinum supply situation has been indicating a glut for some time past and the trend is expected to continue through the rest of the current year. But this need not worry the producers. Not only is the surplus expected to be absorbed fully in the current year, but the depressed price also is likely to recover by a good margin.

According to Mr. Keith Green, operations director at the London-based Johnson Matthey (JM), the world's biggest platinum marketing group, the platinum demand is "incredibly recession-proof" and faces good growth for the next five years.

Platinum demand in 1992, increasingly driven by its use in car anti-pollution catalysts, should be even better than last year and absorb surplus supplies. This should enable the price to recover to $400 by the year-end as against a low of $330 reached last year.

Nevertheless, the fact remains that on the supply side, the Russian factor continues to weigh heavily on the market. Sales by Russia went beyond control last year to reach 1.1 million troy ozs worth at least US $363 million, according to the JM's latest markets. This amount was almost 33 per cent up on 1990 when exports were substantial by recent standards.

One reason Russia had to step up platinum sales in its bid to earn hard currency was the low availability of other precious metal gold. But much of the sales were believed to be used as collateral for loans. The Soviet Bank for Foreign Economic Affairs had to sell most of its platinum holdings of 20 tonnes in swap deals as the break up of the Soviet Union into component republics became as clear as the writing on the wall.

Not that the Russians are not aware of the damage done to the platinum market by their stepped up exports of the metal — prices plunged from a peak of $424 per troy oz to a low of $330, with the average London price falling from $472 in 1990 to $376 last year.

In the current year, Russia is expected to export between 600,000 and 700,000 ozs, almost the same quantity as shipped in 1990. In any case, according to the review, the extra Russian supply helped swell platinum surplus to 120,000 ozs last year, as against a surplus of 30,000 oz in 1990.

The world supply was at a new peak of 4.16 million ozs against 3.73 million ozs in 1990, while the world demand also reached a new high at 4.04 million ozs against 3.70 million ozs.

Sumitomo Corporation of Japan also anticipates a continuing oversupply of platinum notwithstanding a likely recovery in prices at the end of the year or early next year. Sumitomó expects a worldwide platinum supply of 118 tonnes in 1992 against 128 tonnes last year. The slight reduction is ascribed to the lower volume of metal that South Africa and the Commonwealth of Independent States (CIS) expect to put on the market.

South Africa's platinum output is

likely to fall to 90 tonnes from 91 tonnes in 1991 as low prices force mining houses to reconsider their output expansion plans while CIS output could fall to just 18 tonnes depending upon whether it can keep business links with the western economies and is able to overcome the current domestic instability.

On the demand side, Sumitomo expects the worldwide demand from jewellery sector to come down to below 40 tonnes, while investment demand is likely to be halved to 5 tonnes.

NEW COPPER SMELTER NEEDED IN CHILE, REVEALS FEASIBILITY STUDY

A preliminary feasibility study has revealed there is room for a new copper smelter in Chile, an official at Enami, the state smelting agency, said. Enami is likely to issue an official statement later based on the study conducted by Davy McKee World-wide Corporation of the US.

Jaime Olguin, Enami Operations Manager, said the report found there was a need to process an additional 600,000 tonnes of copper concentrates per year, producing 150,000 tonnes of cathodes and 50,000 tonnes of blister. Current Chilean smelting capacity is about 4.0 million tonnes per year. In 1991, Chile produced about 1.3 million tonnes of refined and blister copper.

The study is crucial to determine whether Enami should invest, together with other partners, in Fundicion del Norte, a new smelter in the north of Chile. The study was presented on May 1.

Joining Enami in the venture is Acecunion Miniere (Belgium), Lacminerals (Canada), Arbi Participacoes (Brazil) and Sudamericana Demetales, a local trader and consultant.

According to local press reports, Mitsubishi group of Japan has shown interest in joining the group, although trad sources said that decision hinges or whether Fundicion del Norte wil employ Mitsubishi smelting technology.

According to Olguin, the Davy McKee study did not object to Mitsubishi technology, which traders said has not been employed on a scale the size of Fundicion del Norte.

Elsewhere, Fluor Daniel (USA) has presented its feasibility study to expand Enami's Ventanas smelter to treat 800,000 tonnes per year of copper concentrates from 480,000 tonnes.

Olguin said the study shows the expansion is feasible, and that Enami is negotiating, a long-term supply contract with the Chilean Copper Corporation (Codelco) to obtain 350,000 tonnes of concentrates per year from Codelco's Andina division.

News From Japan

NEW STANDARDS WORKED OUT FOR AGROCHEMICAL RESIDUES

Food Sanitation Investigation Council submitted late in April to the Health and Welfare Minister a report on new standards for tolerable residues of 34 agricultural chemicals in 129 farm products. They include seven products used only abroad and nine post-harvest products, of which four have yet to be registered in Japan. The new standards will be announced this summer and put into force early next year. They have been worked out in response to growing imports into Japan of agricultural products, onto which post-harvest agrochemicals have been applied.

This will be the first case in Japan since 1978 of new standards being established for agrochemicals remaining in farm products. Japan's Ministry of Health and Welfare had set up by that time standards for 26 agrochemicals remaining in 53 agrochemical products: they were all registered in Japan. The ministry called on the council last September to work out new standards for 41 agrochemicals and 34 items out of them have been included in the above mentioned new standards. It also made a similar request last January with regard to 21 other agrochemicals and plans to do so with several other items early in May. The post-harvest agrochemicals concerned include ethoxyquin (antisunten agent) and chlorprophan (sprouting inhibitor).

SYNTHETIC DYE EXPORTS REMAIN BRISK; DOMESTIC DEMAND DULL

Japanese demand for synthetic dyes has remained inactive due to a slump in the domestic fiber-dyeing/processing industry but their exports from Japan have been making a good showing since shipments to Asian countries — in which the corresponding industry is rapidly progressing — continue to attain steady growth. Japan's synthetic-dye production last year exceeded 77,000 tons, hitting a record high for the fifth year in a row. Exports in the year also reached a new high for the sixth straight year. Domestic sales dropped 3.3% from the pre-ceding year but exports showed robust growth of 11.9%.

S. Korea, Taiwan and China still depend on Japan for a supply of high-quality dyes. Japan's synthetic-dye exports to Asian countries last year came to ¥35,629 million ($266 million), up 11%, followed by those to Europe (¥8,444 million, down 14%), North/-Central/South America (¥8,383 million, up 5%) and Africa (¥179 million, unchanged). The share of exports in Japan's total shipments of synthetic dyes (in terms of value) is continuing to rise steadily — 43% for 1989, 44.2% for 1990 and 46.2% for 1991. The share is likely to exceed 50% in the near future.

Some are of the view that domestic demand for the products — disperse dyes in particular — will expand since domestic apparel makers have begun to market men's suits whose material is based on polyester fiber. In actuality, however, the demand did not revive in the first quarter of the year. It is forecast among those concerned that Japanese demand for synthetic dyes for the current year will remain on or drop below the preceding year's level and exports will be continuously on an upward trend.

DAICEL, NIPPON STEEL GROUP TIE UP FOR STYRENE BUSINESS

Daicel Chemical Industries, Ltd., Nippon Steel Corp. and its subsidiary, Nippon Steel Chemical Co., have agreed on co-operative manufacture and processing of polystyrene and other styrenic products. According to the trilateral agreement, Daicel is scheduled to build production facilities for polystyrene (PS; 50,000 t/y), styrene-acrylonitrile copolymer (SAN; 18,000 t/y), biaxially oriented polystyrene film (9,000 t/y) and compounds (20,000 t/y) at Nippon Steel's plant site adjacent to Daicel's Aboshi factory. The plant is to be completed in the fall of 1993.

Nippon Steel Chemical will supply Daicel Chemical with a considerable amount of styrene monomer and they will mutually produce polystyrene sheet and other styrenic products on an OEM basis. Nippon Steel Chemical has hitherto considered building up styrene operations and Daicel Chemical has intended to commercialise polystyrene at the Aboshi factory. Daicel Chemical regards styrenic products as a new business arena and has introduced related technology from Chevron (U.S.). Nippon Steel and Nippon Steel Chemical are pushing ahead with alkylphenol operations in collaboration with Maruzen Petroche-mical Co. They aim to restructure their chemical business by establishing cooperation with Daicel Chemical. Styrenic products and their raw materials have come to be traded in the international market and those concerned are being urged to enhance their international competitiveness.

NEW ETHYLENE FACILITIES PUT INTO TRIAL OPERATION

Mitsubishi Petrochemical Co. held late in April a ceremony for inaugurating trial operation of a new 300,000-t/y ethylene plant located at its Kashima factory. The plant will be put into commercial operation this October.

To enhance its international competitiveness in ethylene business, the company originally set the capacity of the new facilities at 450,000 t/y but later scaled this down to 300,000 t/y due to the current discouraging market conditions. "We'll deliberate on capacity build-up (to 450,000 t/y) with due consideration given to the economic situation," says President M. Yoshida.

The new plant has boosted the company to the position of Japan's largest ethylene maker (potential refining capacity: 1,100,000 t/y). Its construction has been accompanied by construction of other new facilities (benzene, 150,000 t/y; L-LDPE/HDPE, 80,000 t/y; polypropylene, 80,000 t/y and ethylene oxide/ethylene glycol, 180,000 t/y). The PP plant is to be completed at the end of May and the other plants have already been completed.

JV FORMED TO PRODUCE MODIFIED LECITHIN

Kyowa Hakko Kogyo Co. will establish an equally owned joint firm with Mie Prefecture-based True Lecithin Mfg..Co. to produce elaborate-function lecithin to be used in healthcare foods, cosmetics and pharmaceuticals. Functional lecithin is attracting great attention for use as microcapsules for drugs and cosmetics, etc.

Lecithin — any of several phosphatides present in plant and animal cells — has been manufactured from beans and egg yolk as food additives and in recent years a number of modified-lecithin products have proved to have unique bioligical activities, attracting great attention from the pharmaceutical and related sectors. T & K Lecithin Co. to be set up as of July 1 by the two firms will produce improved versions of lecithin modified by enzymes and those with high-purity phosphatidyl choline (PC). These products offer a much wider range of applications for foodstuffs, drugs and cosmetics. PC-enriched lecithin, for example, can be used as a natural emulsifier (liposome) of medicines, delivering them to the target area.

MITSUI PETROCHEMICAL WILL PUSH INVENTORY, PRODUCTION CUTBACKS

Mitsui Petrochemical Industries, Ltd. will promote inventory adjustment and production cutbacks in the April-September period in a bid to improve its deteriorated business by streamlining production systems and boosting prices. Under the plan, the firm will mothball its Iwakuni-Ohtake ethylene plant to reduce inventories of polyolefin there to a level equivalent to less than 2 months' production, put off the operation start-up of the additional phenol and aniline plants completed recently, and cut by 10% production of high-purity terephthalic acid (PTA).

Petrochemical markets here and abroad have generally been easing, worsening makers' business conditions. These steps are ultimately intended to make it easier to have its higher prices accepted by users. Negotiations on petrochemical prices will start from late April-mid-May. Mitsui Petrochemical will idle a 96,000-t/y ethylene plant at the Iwakuni-Ohtake factory over a 3-month period to reduce polyolefin inventories. Its joint venture with Idemitsu Petrochemical — Chiba Phenol — is scheduled to start trial operation this May of a 200,000-t/y phenol plant but continue the test running for a longer period than originally intended. The 190,000 t/y phenol plant at its Chiba factory will also be mothballed or go into partial operation so that its phenol operating rates this year will be kept on the 60% order on average.

The company will also carefully decide the timing of operating its 60,000-t/y advanced aniline plant. Production of PTA now reaching 550,000 tons a year will be slashed by 10% to cope with easing export markets.

CHINA WANTS TO PURCHASE AGRICULTURE-USE PE FILMS

The Chinese government recently sounded out Japanese polyethylene makers including Mitsubishi Petrochemical Co. about purchasing agrochemical-use films from them over several years, according to informed sources. The amount the Chinese want is said to be more than 50,000 t/y for a period of 3-5 years. It is the first tin that China has revealed the intention buying such films in large amounts. Th country is said to want to conclude agreement with the Japanese by the fa The Chinese offer has been welcome by the Japanese who are facing increasingly slack market for polyeth ylene — parti-cularly L-LDPE — Japan where capacity expansion is likel to be carried out successively this yea

The Chinese step reflects, observer believe, her recent policy of stressin economic construction and opening u to the outside. Modernisation of he agriculture is one of the key themes fo her economic development. The film th Chinese side specified is a special-grad L-LDPE supplied by Mitsubishi Petro chemical which had been delivered a samples to Chinese users. However, th amount China wants to receive is too large for Mitsu-bishi to meet by itsel and so a number of Japanese firms wil join the deal.

The unexpected downturn of L-LDPE business in Japan has made makers put off the start-ups of their new plants: Mitsubishi Petrochemical will start operating a plant (co-production system for L-LDPE and HDPE) in October; Asahi Chemical, in July; and Showa Denko and Nippon Petrochemicals Co., in September.

HIGH VALUE-ADDED ZEOLITE BUSINESS BEING STEPPED UP

Mizusawa Industrial Chemicals Ltd., is scheduled to markedly expand its production capacity this June for high value-added zeolite products to 2,000 t/y from the current 800. The manufacturing plant concerned is being operated at full capacity since demand for the products is growing, mainly for use in anti-blocking agents for polyolefin film. Their application is expected to further expand in such fields as resin filler, flattening agents for paints, cosmetics base, abrasives and catalyst carriers.

The zeolite products are aluminosilicate, sodium calcium aluminosilicate —zeolite-based white fine powder in both cases — and completely spherical silica powder. The zeolite market in Japan has to date grown, with application centered on detergent builders until now. However, this form of use is no longer increasing since the elimination of phosphate from almost all detergents. The company has commercialised the sophisticated zeolite products in an effort to improve its zeolite business performance.

SUPPLY-DEMAND SITUATION FOR MELAMINE DISCOURAGING

The supply-and-demand situation for melamine has deteriorated because the main outlets concerned — automobiles, electrical machinery and appliances, and housing, etc. — are sluggish amid the current economic slowdown. In particular, the adhesives sector has been declining, reflecting the decrease in housing starts. Adhesives are the biggest application field for melamine. Exports are dull, reflecting the worldwide economic slowdown.

Nissan Chemical Industries, Ltd. — the largest melamine manufacturer — is adjusting its production. Furthermore, Mitsui Toatsu Chemicals, Inc. and Mitsubishi Petrochemical Company Ltd. are planning to cut production after April. Production of melamine in 1991 recorded about 100,000 tons, a decrease of 4% from the previous year.

Both domestic deliveries and exports declined: the former registered 70,000 tons (down 8%) and the latter, 26,000 tons (down 6%). Looking at details of domestic delivery by use, those for adhesives decreased 9% to 39,500 tons, those for moulding compound dropped 14% to 300 tons, and those for paints (10,300 tons), laminates (6,600 tons), fiber/paper processing (2,000 tons) and others were level with the previous year.

TAIHEI CHEMICAL TO BOOST ACTIVATED CARBON BUSINESS

Taihei Chemical Industry Co. will start expanding its activated-carbon business. It has revealed its intention to advance into the functional-activated-carbon market on a coal basis, which market is expected to expand hereafter for such purposes as highly-sophisticated water treatment. A production base will be established at its Kasugai Plant (Aichi Prefecture). Sample work will be started in the middle of this year, at earliest, to push the business on a commercial basis.

Activated carbon, for which coal is used as raw material, excels in absorbing and water-purifying powers. It is said that this kind of activated carbon will replace the traditional one for the disposal of water at water purification plants. Kuraray Chemical has announced its intention to start activated-carbon business on a commercial basis. Taihei Chemical Industry is to follow Kuraray Chemical Industry in this field. Market competition is likely to stiffen steadily hereafter.

Until now Taihei Chemical Industry has been using calcined chips of wood and sawdust as materials. In accordance with its policy of diversifying activated-charcoal business and improving profitability, however, it has begun to review raw materials. It has decided to start the production of functional activated carbon, using coal as material, on a commercial basis, making use of the calcination and other techniques it has developed until now. In accordance with the uses concerned, it will turn out such kinds of carbons as those prepared from powdered, granulated and cracked coal.

RECORD 1991 SYNTHETIC DYE OUTPUT TOPS 77,000 TONS

Driven by a sixth straight year of export growth, Japan's volume-based production of synthetic dyes in 1991 climbed for the fifth consecutive year to an all-time high exceeding 77,000 tons. The situation at home was less favourable, however. Domestic sales slipped below the previous-year level and inventories climbed, casting a shadow over future prospects. Furthermore, shipments on a value basis edged up a mere 0.8%. Thus, the atmosphere surrounding synthetic dyes, which formerly had prospered under brisk domestic and overseas demand, is steadily changing.

According to figures compiled by Kaseihin Kogyo Kyokai (Japan Dyestuff & Chemical Industry Association), the volume of synthetic dyes produced in 1991 reached 77,109 tons (up annual 3%), while the quantity sold was 74,575 tons (up 1.8%). In value terms, sales increased 0.8% to ¥115,385 million. (See table on next page) Conspicuous, however, was 11% annual drop in domestic reactive-dye sales. Sales of disperse dyes accounting for a relatively high proportion of the total climbed 2.8% from the previous year, but fluorescent-dye sales dropped, thereby casting some doubts over the future of the once flourishing domestic synthetic-dye market. In contrast, export volumes in 1991 renewed previous year records for the sixth year running. Value-based exports also rose, climbing an annual 5% to more than ¥53 billion. Exports now contribute 46.2% of Japan's total dye sales value. If last year's trend continues, export values are likely to exceed domestic figures over the next one or two years. Imports, on the other hand, staged only modest growth.

While incoming shipments from the U.K., Italy, China, India and the U.S. increased, those from South Korea and Taiwan turned lower. The dye market has followed a path of bullish growth over the last five years, and last year's continuing export expansion gave producers another record year. But the annual decrease in domestic shipments

Supply and Demand Estimate of Synthetic Dyes in 1991

	Production	Exports	Domestic sales	Imports
Total	77,109	27,733	46,842	18,470
	(103)	(111.9)	(96.7)	(102)
Direct	6,004	737	5,167	2,943
	(102.4)	(103.1)	(98.3)	(105)
Acid	2,522	679	1,681	2,888
	(95.1)	(91.5)	(88.7)	(90.4)
Basic	4,465	1,105	2,877	1,129
	(102.3)	(91.7)	(103.5)	(100.6)
Mordant & acid mordant	1,642	466	1,287	328
	(124.6)	(220.9)	(120.1)	(91.6)
Sulfur & Sulfur vat	2,144	823	1,375	810
	(72.6)	(77.9)	(77)	(100.5)
Vat	3,029	1,965	784	386
	(98.3)	(116.5)	(74.3)	(89.8)
Azoic	2,378	---	2,491	---
	(101.3)	(-)	(95.8)	(-)
Disperse	22,241	12,036	9,367	2,234
	(110.5)	(116.3)	(102.8)	(120.7)
Flourescent	10,296	1,200	8,984	3,127
	(100.7)	(108.5)	(96.8)	(113.1)
Reactive	16,282	6,563	9,292	3,865
	(99.4)	(118.3)	(89)	(96.8)
Organic Sol-vent soluble	4,162	1,853	2,196	637
	(109.6)	(105.9)	(112.5)	(93.3)
Others	1,944	305	1,342	122
	(110.6)	(72.6)	(110.3)	(113)

Note: Figures in parentheses show percentages against previous year
Source: Japan Dyestuff & Chemical Industry Association

has caused some concern. Observers say the divergence between export and domestic shipment growth could become even more pronounced.

DEMAND FOR ORGANIC PIGMENTS DECREASING REMARKABLY

Demand for organic prigments has begun to cool down. In 1991 both production and shipment of organic pigments slightly exceeded the level of the of the preceding year. In the fourth quarter of last year, however, they fell below the level of the corresponding period of the preceding year. The major customer industries, such as those engaged in printing ink, paint and synthetic-resin colouring, have all lost their vigor. As a result, the demand for organic pigments too has become sluggish. The environment around the organic pig-

ments too has become sluggish. Th environment around the organic piments market, which had been growin smoothly during the past several year seems to have changed greatly.

According to Kaseihin Kogy Kyokai (Japan Dyestuff & Chemic Industry Association), production c organic pigments last year increased b 2.9 per cent and sales increased by 1. per cent over the level of the precedin year. Actual sales, which steadil increased by 3.2 per cent in the fir quarter, 5.6 per cent in the second qua ter and 5.5 per cent in the third quart in comparison with the correspondin period of the preceding year, decrease by 6 per cent in the fourth quarte giving rise to a strong sense of stalling Last year output of printing ink, whic is the major customer industry remained at the level of the precedin year. In addition, output of paint fell b 4 per cent in comparison with the leve of the preceding year. This led to th stagnation of production and shipmen of organic pigments.

Exports seem to be retaining thei firm tone. According to the Ministry o Finance's trade statistics, exports b volume during last year exceeded th level of the preceding year by about per cent. There is the impression tha exports are compensating for the stag nant domestic demand. However, th level of production in related industria circles, such as printing ink and paint

Supply and Demand for Organic Pigments in 1991
(in tons;¥1 million)

	Production Volume	Sales	
		Volume	Value
Azo Lake	10,599 (101.0)	6,364 (102.1)	12,891 (100.2
Phthalocyanine	12,372 (104.9)	9,026 (102.5)	20,812 (108.1
Lake pigments	735 (97.4)	724 (93.4)	2,934 (92.8
Total	23,706 (102.9)	16,114 (101.9)	36,636 (103.8

Note: Parenthesied figures show percentages against the previous year.

did not recover last year after it fell in the autumn. It has remained low since January this year, too. There are still few signs of recovery.

POLYOLEFIN EXPORTS FROM SOUTH KOREA SOARING

Polyolefin exports from S. Korea — mainly to China, Hongkong and Indonesia — are rapidly expanding with combined shipments for January and February exceeding 200,000 tons — LDPE, 52,000 tons; HDPE, 73,000 tons; and PP 96,000 tons.

In 1991 they came to 540,000 tons, 2.5 times higher than the preceding year's level. If the current upward trend continues, they will top one million tons for the whole of 1992. The brisk polyolefin exports are believed to boost operation rates for petrochemical plants in S. Korea to more than 90% but the industry there still sufers from poor profitability resulting from large depreciation expenses. In sharp contrast to the growing exports, S. Korea's polyolefin imports dropped considerably in 1991 — LDPE, 85,000 tons (down 30%); HDPE, 24,000 tons (down 15%) and PP, 14,000 tons (down 12%).

Ethylene capacity in the country expanded markedly from the 1.15 million t/y registered at the end of 1990 to 2.55 million t/y at the end of last year. There are large-scale capacity build-up plans for polyolefin but domestic demand for the product is not likely to attain appreciable growth. LDPE and PP capacities in 1991 remained almost unchanged and declined slightly, respectively.

MITSUI PETROCHEMICAL TO BEGIN FSs ON PTA IN THAILAND, MALAYSIA

Mitsui Petrochemical Industries Ltd., will begin feasibility studies on high-purity terephthalic acid (PTA) projects for Thailand and Malaysia, as its PTA project for Indonesia which the firm planned earlier has been frozen due to the Indonesian government's policy.

PTA is a material for polyester fiber whose demand has been on a steady rise in Southeast Asia. The Japanese firm tendered in the past for the construction of PTA plants in Thailand and Malaysia and is now thinking of carrying out such a project in one of the three countries. It had planned a 250,000-t/y PTA project for Indonesia and although this has been suspended because of the nation's financial difficulties, the firm still considers Indonesia to be the best candidate for its project.

PTA is one of the company's core businesses for which the firm has increased investment for expansion; it has established a production setup of the 550,000-t/y scale at its Ohtake factory, Japan. The recent move reflects Mitsui's desire to quickly kick off a PTA project in Southeast Asia where capacity for polyester fiber is being actively expanded.

ICI of the U.K. is scheduled to start operating in June a 350,000-t/y PTA plant in Taiwan, and Tumtex Fiber of Taiwan and Mitsubishi Kasei of Japan are expected to commence PTA production in Thailand and Indonesia, respectively, in 1994/1995. Mitsui Petrochemical is lagging behind these firms.

POM PLANT STARTED UP IN TAIWAN

Taiwan Engineering Plastics' 20,000-t/y polyacetal (POM) resin plant recently went into commercial operation. The company — jointly owned by Polyplastics Co., the Hoechst group and local interests — started construction work on the ¥16,000 million ($119 million) plant in June 1990.

Polyacetal manufactured mainly for use in cassette tape reels and electronics/electrical parts will be sold on the Asian market where there is a high demand increase of over 15% a year. The POM technology concerned has been developed by Polyplastics, Farbwerke Hoechst AG (Germany) and Hoechst/Celanese (U.S.) during the past 30 years.

In the past several years, Korea Engineering Plastics and Lucky (both S. Korea) have constructed POM polymerisation plants. Furthermore, Du Pont (U.S.) has branched out into POM-compound business in Singapore. Thus, competition in the Asian market has been intensified.

UNCERTAINTY REIGNS IN WORLD UREA TRADE

The world's urea trade is put at about 20 million t/y, 30% of which China accounts for, acting as the largest urea consumer. China's urea imports at present can be translated into 6-7 million tons on an annual basis: they once peaked at 9 million t/y but the country is now reducing imports for inventory adjustment.

In Malaysia and other Southeast Asian countries, urea is being replaced by comparatively inexpensive ammonium sulfate, thereby causing a gradual reduction of urea prices. On the other hand, India plans to import a large amount of the product for the first time in five years. It has already bought about 300,000 tons and is projected to import a total of 1.5 million tons this year. Her aggressive importing is thought to make up for the setback in China's imports.

On the supply front, CIS member republics independently supply urea products, which are, however, competing with each other. There are bottlenecks in their delivery systems.

In some cases, for example the products cannot be loaded on ships which have docked at a port for one and half months. Kuwait has resumed urea exports, thereby boosting global supply capacity.

New Developments from Japan

GROWTH HORMONE RELEASING AGENT TECH. LICENSED TO U.S. FIRM

Kaken Pharmaceutical Co. of Japan has announced that it has granted the rights for the development and marketing of growth hormone releasing peptides (GHRPs) to Wyeth-Ayerst Laboratories, the drug division of American Home Products Corp. of the U.S.

The Japanese firm had been licensed technology, covering all parts of the world, for production of GHRP raw material from Tulane University and Polygen Holding Corp. of the U.S. but considered it difficult to commercially develop the manufacturing technology by itself.

The agreement offers to Wyeth-Ayerst the exclusive development and sales rights for the U.S. and Canada as well as an option for the corresponding rights for Europe, Central & South America, Oceania and Africa in exchange for an offer to Kaken of the sales rights for Japan of Wyeth's GHRP products.

The Japanese firm will produce and supply GHRP raw material to the U.S. firm. Kaken also retains the rights for the sales of the products concerned in areas where the U.S. firm will be able to sell its GHRPs.

GHRPs, which are peptides comprising 6-7 amino acids, stimulate the pituitary gland and hypothalamus to release growth hormone. They can be taken orally and it is expected that their dosage period will be shorter than that of the conventional growth hormone preparations which have been administered by means of shots. Kaken has recently developed a GHRP (development code: KP-102) having activity about 10 times greater than that of other GHRPs.

CO_2-TO-CO CATALYST BARED

Government Industrial Research Institute, Nagoya has developed a tungsten-sulfide catalyst capable of converting carbon dioxide into carbon monoxide usable as industrial feedstock. The new catalyst is obtained by reducing ammonium tetrathiotungstate at a temperature of 400°C.

The product is superior to tungsten disulfide and tungsten in changing carbon dioxide into carbon monoxide. It hardly turns out by-products with the yield ratio of carbon dioxide reaching more than 99.9 per cent. Carbon monoxide thereby produced can be employed as feedstock for such useful chemical products as methanol, formaldehyde and ethylene glycol, etc. The new catalyst is also expected to facilitate the establishment of carbon-recycling technology, thereby paving the way for preventing global warming. A total of 20 billion t/y of carbon dioxide are released all over the world, allegedly causing the global warming.

SYNTHETIC-RUBBER SEALANT RESISTANT AGAINST CFCs

Mitsubishi Cable Industries, Ltd., has developed a new synthetic rubber having strong resistance against CFC 12, CFC 134a and oil-/mineral-based refrigerating-machine oil. The new product is being supplied on a trial basis in the form of an O-shaped ring — sealant for automotive airconditioners.

The product is obtained by blending hydrogenated nitrile butadiene rubber (HNBR) with a large amount of carbon black (weight ratio: 40-70%). When it is soaked in the two coolants (CFC 12 and 134a) and the said oil, its volume only changes by less than 10%, denoting that it has the low degree of expansion needed for sealants. Moves are being made in Japan towards employing CFC 134a as a substitute for CFC 12 amidst the growing concern ab ozone-layer depletion.

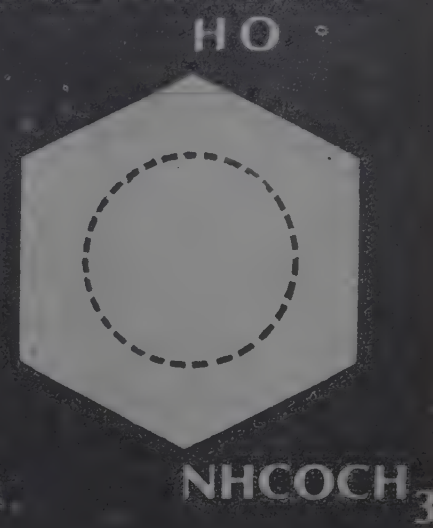
It is forecast that CFC 134a m eventually account for about 50% of the CFCs used in Japan. In the circu stances, there is growing demand fo sealant with tough resistance against substitutive CFC as well as refrige ting-machine oil. The sealant is requi to have thermal, expansion and agi resistance. The new product is believ to meet the requirements.

SUMITOMO CORP. SOLE AGEN FOR U.S. MEDICAL COLLEGE FIRM

Sumitomo Corp. has concluded sole-agent contract for Japan with American subsidiary, BCM Technolo (BCMT), of Baylor College of Me cine in Houston, Texas — one of U.S.'s leading medical colleges. T tie-up agreement is intended to prom licensing business in Japan concerni medical technology and know-h developed by the U.S. college.

Baylor College, which is a memb of Texas Medical Center — the worl largest medical treatment and serv enterprise — is engaged in a wide ran of research fields and, in particular, h obtained dazzling results in gene th apy and transgenics. BCMT was set by Baylor College as its wholly own subsidiary to commercialise the resea results achieved by the college which among the top-5 medical colleges in States in terms of research success

The U.S. firm has committed itself patent application, recruiting possi business partners for commercialisati licensing business, joint R&D activit and establishment of venture busines for application of the specific techn logy concerned. The company has so been involved in the setting up of ab 10 venture businesses. The giant J anese trader intends to push busines licensing and technical transfer BCMT targeting Japanese drug co panies.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MARKET INFORMATION

Bromamine acid up

Prices of bromamine acid firmed up by Rs. 2 per kg in the Bombay Market during the week under review, following a revision in prices by a leading manufacturer. OT-base also firmed up by Rs. 15 per kg due to increase in prices of raw materials. Supplies of aniline have been poor, but this has not yet reflected on the prices. Diethylamine has firmed up Rs. 5 per kg.

Trading was limited. The increase in sales tax has limited offtake.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on June 9, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.25
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	5.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	105.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	6.00
Borax (Granular)	38.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	95.00
Butyl carbitol	110.00
Caustic soda (Flakes)	17.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	4,400.00
Copper sulphate	34.00
Chromic acid	74.00
Dimethyl formamide	105.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	180.00

Hydro	60.00
Hyflosupercell	48.00
Hexamine (Resale)	32.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	17.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	47.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	200.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	40.00
Phthalic anhydride (Resale)	41.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	72+ST
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	75.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	105+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	17.50
Acetic Anhydride (Resale)	35.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	70.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	34
Benzo trichloride	16
Benzoyl chloride	22
Bromine Liquid	115
Chloroform	65
Carbon Tetrachloride	27
Cellosolve	70
Cyclohexanone	80
Cyclohexanol	85+
Diacetone (Resale)	29
Diethyl Oxalate	34
Diethyl glycol (DEG) (Resale)	42
Dioctyl Phthalate	69
Diallyl Phthalate	44
Dimethyl Phthalate	48
Dioctyl Adipate	58
Dibutyl Adipate	42
Dipentene	15
Dimethylamine 40%	30
Dimethylamine 50%	35
Ethyl Acetate	27
Ethyl Acrylate	92
Ethylene Dichloride	21
Ethylene Glycol	32
Formic Acid (Imp.)	34
Formaldehyde (Resale)	7
Glycerine (CP)	70
Glycerine (IW)	65
Hydrogen Peroxide 50% (Resale)	47
Isopropyl Alcohol	45
Isobutyl Alcohol (Resale)	35
Monoethanolamine (Resale)	95
Melamine	62
Methyl Ethyl Ketone	58
Methyl Isobutyl Ketone	60
Methyl Acrylate	72
Methylene Dichloride (Resale)	30

Carbitol	115.00+ST
Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol*	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	68.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	18.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	19.50
Xylene (Ortho)	32.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	81.00
Alpha Naphthol (Imp.)	200.00
Aceto Acetic Ester (Methyl)	145.00
Acetanilide	60.00
Anthraquinone	150.00
Anthranilic Acid	110.00
2-Amino 4-Nitrophenol	150.00
Blue B. Base (Local)	320.00
Beta Naphthol	74.00
Benzidine Dihydrochloride (BDH)	94.00
Bromamine Acid (IDI)	670.00
BON Acid	130.00
CPC (Crude)	115.00
Chicago Acid (Atul)	360.00
Coach Acid	60.00
Cyanuric Chloride (German)	250.00
DEMAP	255.00
2,4-DNCB	29.00
Dichlone (Imp.)	400.00
Dimethyl Aniline	100.00
Diethyl Aniline	180.00
Diethyl Sulphate (Japan)	85.00
Diethyl Sulphate (Local)	75.00
Diamino stilbene disulphonic acid	215.00
3,3-DCB	260.00
Diphenylamine (U.K.)	165.00
Gamma Acid (Atul)	220.00
Gamma Acid (Local)	180.00
H. Acid (Atul)	170.00
G. Salt	78.00
J. Acid	370.00

J. Acid Urea	4[illegible]
K. Acid	12
MPDS (Local)	15
MNA	12
Meta Ureido Aniline	17
MPD (Local)	18
MPD (German)	21
N-Methyl J. Acid	53
N-Methyl Aniline	13
Naphthalene (Refined)	3
Ortho Anisidine (OA) (Imp.)	10
Ortho Dichloro Benzene (ODCB)	2
OT Base	17
OT Liquid	7
Para Dichloro Benzene (PDCB)	3
Para Anisidine (PA local)	15
PNA	8
Para Cresidine (Imp.)	34
Para Amino Azo Benzene (India)	14
PNCB (HOC)	42
Para Nitro Toluene	92
1-Phenyl 3-Methyl 5-Pyrazolone	175
Phenyl J. Acid	425
PT Base	160
Rhoduline Acid	620
Resist Salt 80%	26
Resorcinol	350
Sodium Naphthionate	80
5-Sulpho-Anthranilic Acid	115
Sulphanilic Acid	44
Sulpho Tobias Acid	130
Tobias Acid (Imp.)	112
Metanilic Acid	51
MTD (German)	185
Vinyl Sulphone	125

Bombay Drugs Market

(Prices as on June 9, 1992)

Product	Rs./kg.
Adipic Acid	95
Aerosil	590
Aluminium Hydroxide IP	43
Ampicillin Sodium	4400
Ampicillin Trihydrate	3400
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2700
Analgin	310
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1450
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium-Lactate	30
Calcium D Pantothenate	1475
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2750
Chlorpropamide	235
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3100
Cimetidine	3350
Citric Acid IP	95
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	1950
Diclofenac Sodium	2400
Dicyclomine HCl	2200
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	350
Disodium Hydrogen Citrate	92
Dithranol	7000
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2650
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	725
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	120
Hydroxylamine HCl	575
Hydroxylamine Sulphate	105
Ibuprofen IP	500
Imipramine HCl	5000
Indomethazine	1075
I.N.H.	375
Inositol IP	1400
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	105
Lactic Acid (Japan)	165
Levamisole	1950
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	160
L. Lysine Pharma Grade	250
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	280
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	325
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	500
Metronidazole Benzoate	515
Morpholine	180
Neomycine Sulphate	4200
Niacin	300
Niacinamide	375
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	200
Nipagin Sodium	200
Nipasol Plain	300
Nipasol Sodium (Propyl Paraben Sodium)	320
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	5000
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	142
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	525
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	225
Piperazine Hexahydrate	180
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2100
Pyroxicam	3100
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	260
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	840
Sulphacetamide Sodium	370

Product	Rs./kg
Sulphadoxine	290
Sulphamethoxazole	37
Sulphasomidine	47
Sulphaphenazole	32
Terbutaline Sulphate	3000
Tinidazole	48
Theophylline Anhydrous	41
Thiacetazone	32
Thoridazine HCl	2000
Thycol (Potassium Gluconate Sulphate)	50
Tolbutamide	22
Trifluopromazine HCl	1100
Trifluoperazine HCl	1250
Trimethoprim IP	185
Tween 80	27
Vitamin B6 Hydrochloride	300
Vitamin B2 5-Phosphate	460
Vitamin K-3 (Water soluble)	75

EXPORT C.I.F. PRICES FOR BULK DRUGS FROM INDIA
(Prices in US$)

Ampicillin Trihydrate B.P.	73.00
Amoxycillin Trihydrate B.P.	76.00
Cephalexine B.P.	176.00
Chlorpropamide HCl	7.50
Chlorbutol B.P.	6.50
Chloramphenicol Powder B.P.	54.00
Chloramphenicol Palmitate	53.00
Chlorpheniramine Maleate B.P.	36.00
Dimetridazole	11.00
Ethambutol HCl B.P.	36.00
Erythromycin Stearate B.P.	65.00
Erythromycin Estolate B.P.	70.00
Erythromycin Base B.P.	85.00
Erythromycin Base USP	80.00
Furosemide B.P.	63.00
Ferrous Fumarate USP XXI	1.60
I.N.H.	8.25
Iodochlorohydoxyquinoline USP XXI	18.50
Ibuprofen B.P.	12.00
2-Methyl 5-Nitro Imidazole	7.50
Mebendazole USP XXI	22.00
Metochlopramide HCl	65.00
Nifedipine USP XXI	47.00
Niacinamide B.P.	7.75
Niacin B.P.	7.00
Ortho Nitro Benzaldehyde	55.00
Oxyphenbutazone B.P.	25.00
Pheniramine Maleate B.P.	45.00
Potassium Iodide B.P.	10.50
Phenolphthalein B.P./USP/ White	10.50
Pyrazinamide B.P.	36.00
Paracetamol B.P.	4.80
Pyroxicam USP XXI	95.00
Riboflavin Sodium Phosphate USP XXI	90.00
Salbutamol Sulphate B.P.	260.00
Sodum Iodide B.P.	13.00
Sulphamethoxazole	10.50
Tinidazole B.P.	14.00
Tolbutamide	8.00
Trimethoprim B.P.	32.00
Thiacetazone	13.00

Bombay Dyes Market

(Prices as on June 9, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.5
Blue RR Supra Powder	629.3
Brill. Blue 2R Supra Disp.	115.6
Dark Blue 2R Powder Fine	512.6
Blue BC Supra Disp.	419.6
Jade Green XBN Powder Fine	555.8
Jade Green XBN Acra Conc. Pdr.	1026.0
Jade Green 2G Pdr. Fine	533.2
Jade Green 2G Ptg. Paste	125.4
Jade Green XBN Ptg. Paste	126.0
Jade Green 2G Supra Disp.	618.0
Olive D Pdr. Fine	563.9
Olive Green B Supra Disp.	421.7
Jade Green XBN Supra Disp. (N)	327.3
Olive OMW Pdr. Fine	698.5
Olive OMW Supra Disp.	538.0
Olive D Supra Disp.	361.7
Olive R Supra Disp.	470.2
Olive D Ptg. Paste	193.0
Olive Green B Ptg. Paste	199.1
Olive Green B Acra Conc.	741.1
Olive R Acra Conc.	779.8
Brown R Pdr. Fine	869.4
Dark Brown 3R Fine	826.2
Brown G Supra Disp.	582.0
Brown 2G Supra Disp.	716.1
Brown R Supra Disp.	547.3
Brown BR Powder	867.7
Dark Brown 3R Ptg. Paste	217.1
Dark Brown 3R Supra Disp.	529.6
Brown G Acra Conc.	967.9
Brown M. Powder Fine	768.8
Grey M. Supra Disp.	585.4
Blue BC Acra Conc. Pdr. Fine	762.7
Direct Black AC Supra Disp.	415.7
Direct Black AC Pdr. Fine	574.7
Direct Black CH Supra Disp.	490.4
Direct ACD Ptg. Paste	217.1

Delhi Market

DELHI: JUNE 5 (NNS) On the whole, an easy tendency was noticed in the local chemicals market during the week under review. On liquidation of inventories by the stockists due to tight money market conditions coupled with slack demand from local as well as upcountry buyers, mercury, in the local market, slumped by Rs. 200 to Rs. 8000 per flask. Similarly, on satisfactory supply position coupled with lack of follow up support, citric acid Bombay Dyeing closed the week with a sharp fall of Rs. 300 at Rs. 4800 per 50 kg. Initial firmness in citric acid China turned weak at the weekend and it came down to Rs. 4250 from Rs. 4400 per 50 kg still showing a gain of Rs. 150 over its last week level. In the absence of buying support, paraffin wax declined by Rs. 35 to Rs. 1125 per 50 kg. Similarly, due to slack support from local as well as upcountry buyers, residue and slack wax tumbled down by Rs. 300/900 to Rs. 8000 and Rs. 12,600 per tonne respectively, while, due to restricted supply, match wax shot up to Rs. 18,000 from Rs. 17,000 per tonne. Following adequate supply from producing areas of U.P. coupled with lack of follow up support from local as well as from Pakistan and Afghanistan, menthol bold suffered a loss of Rs. 15 to Rs. 265, menthol flake and medium grade slumped by Rs. 20 each to Rs. 230 and Rs. 250 per kg respectively. June-July menthol flake delivery was quoted at Rs. 228 against Rs. 245 per kg. Menthol oil declined to Rs. 157 from Rs. 160 per kg. Spot menthol oil prices suffered a setback of Rs. 10 at Rs. 161 per kg. DMO, however, maintained its last week closings of Rs. 65 per kg on scattered support. In the absence of support from bakeries, ammonia bicarb slipped by Rs. 5 to Rs. 170 per 25 kg.

On offerings of K. brand titanium from Calcutta coupled with better follow up support, titanium dioxide TTP improved by Rs. 2 in the beginning, but later due to lack of support, it reverted back to its previous closings of Rs. 74 per kg. However, K.Brand titanium and RC-822 titanium remained firm at their last week closings of Rs. 73 and Rs. 95 per kg respectively.

(DELHI MARKET RATES AS ON JUNE 5, 1992)

Ammonia Bicarb (Per 25 Kg.)	170.00
Mercury (Per flask)	8,000.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	810/820.00
Citric acid (Per 50 Kg.)	4,250/4,800.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCl (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	415/425.00
Sod. Hydrosulphite (Per Kg.)	55.50/65.00
Rangolite (Per Kg.)	115.00
Safolite (Per Kg.)	79.00
Chatkolite (Per Kg.)	72.50
Decolite (Per Kg.)	96.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,800.00
Paraffin Wax (Per 50 Kg.)	1,125.00
Slack wax (Per metric tonne)	12,600.00
Tartaric Acid (France Per Kg.)	488.00
Borax Granular (Per 50 Kg.)	1,650.00
Borax Crystal (Per 50 Kg.)	1,925.00
Sodium Nitrite (Per 50 Kg.)	750/825.00
Sodium Nitrate (Per 50 Kg.)	530.00
Camphor Thal (Per Kg.)	138.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	265.00
Menthol Medium (Per Kg.)	250.00
Menthol Flake (Per Kg.)	230.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	160.00
Glycerine (Per Kg.)	65.00/70.00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.50
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	43.50/44.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (per 50 Kg.)	750.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	74.00
Titanium Dioxide RC-822 (Per Kg.)	95.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	73.00
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	56.00/66.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg)	31.75/32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,100
Match Wax (Per tonne)	18,000.00
Residue Wax	8,000.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T.	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

Dull conditions continue to prevail in the market. On account of poor collections from consuming industries, traders are apprehensive to make large purchases. Supplies of solvents like IPA, MIBK, PEGs continue to be bad. There has been a slight spurt in the prices of citric acid. DBP prices shot up on account of poor arrivals arising out of shortage in the availability of normal butanol.

(MADRAS MARKET RATES AS ON JUNE 6, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.50
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	48.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per 50 kgs)	300.00
Borax (per kg)	32.00
Boric Acid (per kg)	62.00
Calcium Chloride Solid (per kg)	4.00
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	9.00
Calcium Carbonate (Precipitated) (per kg)	8.00
Caustic Soda Flakes (per kg)	17.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	40.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.50
Ferrous Sulphate Crystal (per kg)	5.00
Hydros (TCPL) (per kg)	57.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	43.00
Hyflosupercell (per kg)	48.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	24.00
Magnesium Chloride (per kg)	4.00
Magnesium Sulphate (per kg)	4.00
Mercury (per 34.5 kgs)	7,900.00
Nickel Chloride (per kg)	200.00
Nickel Sulphate (per kg)	200.00
Phosphoric Acid (per kg)	38.00
Potassium Carbonate (per kg)	42.00
Potassium Chromate (per kg)	48.00
Potassium Hydroxide (per kg)	45.00
Soda Ash (TAC) (per 75 kgs)	520.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	10.00
Sodium Sulphite (per kg)	14.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	29.00
Trisodium Phosphate (per kg)	14.50
Titanium Dioxide (Anatase) (per kg)	67.00
Titanium Dioxide (Rutile) (per kg)	100.00
Zinc Chloride (per kg)	22.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	16.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	36.00
Acetic Acid (per kg)	22.50
Acid Slurry (per kg)	36.00
Benzoic Acid (per kg)	45.00
Citric Acid (per kg)	85.00
Formaldehyde (per kg)	11.00
Glycerine I.W. (per kg)	67.00
Glue Flakes (per kg)	19.00
Hexamine (per kg)	36.00
Maleic Anhydride (per kg)	48.00
Menthol Crystals (per kg)	280.00
Oxalic Acid (per kg)	17.00
Pentaerythritol (per kg)	67.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	195.0
Phthalic Anhydride (per kg)	44.0
Sodium Acetate (per kg)	16.0
Sodium Alginate (per kg)	250.0
Sorbitol (per kg)	27.0
Urea (Technical) (per kg)	4.0

SOLVENTS

Acetone -- HOCL (per kg)	33.C
Benzene (per litre)	24.C
Butanol (per kg)	60.C
Butyl Acetate (per kg)	54.C
Carbon Tetra Chloride (per kg)	28.C
Cellosolve (per kg)	75.C
Chloroform (per kg)	35.C
Diacetone Alcohol (per kg)	46.C
Diethylene Glycol (per kg)	44.C
Di-butyl Phthalate (per kg)	76.C
Di-octyl Phthalate (per kg)	72.C
Ethyl Acetate (per kg)	28.C
Isopropyl Alcohol (per kg)	48.C
Methanol (per kg)	14.C
Methylene Chloride (per kg)	29.C
Methyl Ethyl Ketone (per kg)	66.C
Methyl Isobutyl Ketone (per kg)	60.C
Octanol (per kg)	90.C
PEG 400 (per kg)	80.C
Perchloroethylene (per kg)	40.C
Propylene Glycol (per kg)	67.C
Trichloroethylene (per kg)	32.C
Trichloroethane (per kg)	37.C
Toluene (per kg)	22.C
Xylene (per kg)	32.C

CALCUTTA MARKET
(Prices as on June 7, 1992)

Acetic acid (per 50 kg)	725.0
Basic chrome sulphate (per 50 kg)	850.0
Benzene (litre)	14.0
Bleaching powder (bag)	230.0
Borax granular (per 50 kg)	N/
Boric acid (per 50 kg)	2,750.0
Camphor (per kg)	92-94.0
Caustic soda solid	N/
Caustic soda flakes (per 50 kg)	800.0
Glycerine (per kg)	52.5
Menthol bold (per kg)	285.0
Menthol medium (per kg)	325.0
Menthol small (per kg)	275.0
Phosphoric acid (per 50 kg)	1,400.0
Phenol (per kg)	42.0
Soda ash (75 kg)	395.0
Sodium bichromate (per 50 kg)	3,250.0
Sodium bicarbonate (per 50 kg)	375.0
Sodium nitrate (per 50 kg)	450.0
Sodium sulphate anhydrous (per 50 kg)	NA
Sulphuric acid (per ton)	2,200.0
Trisodium phosphate (per 50 kg)	375.0
Toluene (litre)	18.0

Technology Transfer Opportunities

RESOURCES AVAILABLE

PAPER FACTORY
Canada

A reputed organisation in Canada is interested in setting up a paper factory as a joint venture in India using bagasse as a raw material. The company is also interested in establishing a high quality printing house to service local and export industry. (*Ref.: RA653)*

PROTEINS FROM SUGAR-CANE BAGASSE
Egypt

Researchers in Egypt have developed a process for manufacturing proteins by microbial conversion of sugarcane. The process, based on fermentation, includes the following main steps:

* treating bagasse with 1 per cent sodium hydroxide solution for eight hours,
* steaming the bagasse to ensure aseptic condition
* fermenting the bagasse in a rotary drum reactor at ambient temperature
* applying continuous steam of humid air, and stirring the bagasse to ensure aerobic condition
* inoculating the bagasse with "trichderma verdi 253-m 16"
* adding a nutrient solution, containing 2.4 g diammonium sulphate, dihydrogen potassium phosphate and 0.5 g glucose per litre.

The fermentation lasts for about 28 days. The moisture content should be kept constantly at 75-80 per cent and the most suitable ambient temperature is about 300°C. According to the researchers, the process improves the nutritional value of crude bagasse by increasing protein content by up to 28 per cent.

The National Research Centre is a part of the ministry of scientific research. The centre has over 3,000 researchers working in fully equipped research facilities in different fields. (*Ref.: RA 654*)

ETHYL BENZENE
India

A single step reaction process for conversion of ethyl alcohol and benzene into ethyl benzene. The reaction is carried out in the vapour phase over a zeolite based catalyst in a series of alkylation reactors. The higher ethylbenzene formed in the alkylation step are transalkylated to ethylbenzene in another reactor. The reactor products are than condensed and purified in a series of distillation columns for the removal of unreacted benzene higher ethylbenzenes and other impurities. (*Ref.: RA655*)

LIGNINOLYTIC ENZYMES
Russia

The enzymes are produced by Solid State Fermentation of the fungus *Panus tigrinus* on wheat straw or saw dust. Two pure enzymes are used in the technique — mn-peroxidase and oxidase. Total ligninolytic activity of culture and activity of ligninase increase 6-8 fold compared with submerged cultivation. (*Ref. RA656*)

ACRYLIC ACID
Japan
(Ref.: 657)

SODIUM CARBOXY METHYL CELLULOSE
Korea
(*Ref.: RA658*)

TRIZOL
Korea
(*Ref.: RA659*)

BUTYL PHENYL METHYL CARBAMATE
Korea
(*Ref.: 660*)

Details of the companies offering/requiring the mentioned technology, or wishing to import the said items, can be had from the **Technology Transfer Association** by quoting **Chemical Weekly,** and the reference number (appearing at the end of each item), at the following address: Technology Transfer Association, Ish Kripa, 31, Jai Bharat Society, 3rd Road, Khar (West), Bombay 400 052. The Association levies Rs. 50/-for each resource available ref. and Rs. 100/- for each resource sought, wish to import and wish to export ref to cover administrative charges. No charges are levied to members. Membership application form and details can be had from the Technology Transfer Association.

THIOPAN
Korea
(*Ref.: RA661*)

OXYDONG
Korea
(*Ref.: RA662*)

REVERSE OSMOSIS MEMBRANE PROCESS
Korea
(*Ref.: RA663*)

PHENOL/ACETONE
Korea
(*Ref.: RA664*)

EPDM
Korea
(*Ref.: RA665*)

NYLON-6
Korea
(*Ref.: RA666*)

ACRYLONITRILE-BUTADIENE-STYRENE COPOLYMER
Korea
(*Ref.: RA667*)

POLYSTYRENE
Korea
(*Ref.: RA668*)

NORFLOXACIN
Korea
(*Ref.: RA669*)

PEFLOXACIN
Korea
(*Ref.: RA670*)

PHTHALIC ANHYDRIDE
Korea
(*Ref.: RA671*)

LINEAR ALKYL BENZENE
Korea
(*Ref.: RA672*)

PURIFIED TEREPHTHALIC ACID PLANT
Korea
(*Ref.: RA673*)

CEFOTAXIME SODIUM
Korea
(*Ref.: RA674*)

CEFTRIAXONE DISODIUM
Korea
(*Ref.: RA675*)

MONOSODIUM GLUTAMATE
Korea
(*Ref.: RA676*)

ACETAMINOPHEN from p-NITROCHLOROBENZENE, NITROBENZENE
Korea
(*Ref.: RA677*)

CEFALEXIN, CEFADROXYL, CEPHRADINE
Korea
(*Ref.: RA678*)

AMPICILLIN TRIHYDRATE
Korea
(*Ref.: RA679*)

AMOXYCILLIN TRIHYDRATE
Korea
(*Ref.: RA680*)

AMOXYCILLIN SODIUM
Korea
(*Ref.: RA681*)

7-ADCA (RING EXPANSION)
Korea
(*Ref.: RA682*)

6-APA
Korea
(*Ref.: RA683*)

HIGH YIELD BAGASSE PULP
Cuba

This is a chemi-mechanical process for production of high yield sugarcane bagasse pulp suitable for non-permanent paper grades. The process involves a mold impregnation pre-treatment of the clean fibre, followed by two-stage disc refining, in order to produce good quality fibre, whole bagasse is thoroughly depithed at the sugar mill. The pith fraction may be utilized as fuel for the sugar boilers or for other uses, such as cattle-feed or conditioner for some types of soil. It is preferable that only stored bagasse be consumed by the pulp mill. (*Ref.: RA684*)

CITRONELLA OIL
India

Citronella oil is a natural essential oil, obtained by steam distillation of citronella grass, botanically known as *cymbopogen winterianus jowitt*. This oil serves as a starting material for the manufacturing of geraniol and citronellol, which are extensively used in perfumery industry for scenting of soaps, detergents and incense sticks. Manufacturing of citronella oil consists of following two stages (1) Cultivation of citronella grass; and (2) Distillation of cultivated grass for extraction of oil. Cultivation of citronella gass can be undertaken on wastelands hilly-slopes and on high lands which are not suitable for cultivation of crops like paddy. (*Ref.: RA685*)

METHOD FOR RECOVERY OF RIBOFLAVIN
USA

A method for the recovery of riboflavin from a fermentation broth or ot feed stock is disclosed. The meth comprises a process for the producti of large, pure riboflavin crystals fr an alkaline, aqueous solution contain solubilized riboflavin. The method c further comprise the process for produ tion of large, pure riboflavin crystals combination with two solid-liquid se aration steps, the latter of which c result in a final riboflavin product pur of at least about 96% by weight. (*Re RA686*)

CARBONLESS PAPER
India
(*Ref.: RA687*)

GLUE STICK
India
(*Ref.: RA688*)

SYNTHETIC PIGMENT
India
(*Ref.: RA689*)

ACRYLIC EMULSION
India
(*Ref.: RA690*)

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Paraffin

Abastecedora y Exportadora de Parafina S.A., Ave. Lomas de Sotelo No. 1112-101, Loma Hermosa, 11200 Mexico, D.F., Mexico. Tel.: 5-3954399; Fax: 5-3952491.

Metallic iodine

Raw Materials Inc., Attention: Teofilo Suarez H., Departamento Comercial, Calle Manuel Maria Icaza No. 15, Ave. Samuel Lewis, P.O. box: 4493, Panama 5, Panama. Tel.: 635333.

Mercury

Aldrett Hermanos S.A. de C.V., Aquiles Serdan No. 830 Santiago, 78040 San Luis Potosi, S.L.P., Mexico. Tel.: 48-128132, 48-128118; Fax: 48-128347; Telex: 13628 DEME ME.

Aluminium silicates

Glassven C.A., Zona Industrial Soco, Calle Las Rosas, No. 24, P.O,. Box: 246, La Victoria, Estado Aragua, Venezuela. Tel.: 44-212697, 44-215912; Fax: 44-217552. Telex: 44112 GLASS VC.

Dextrins

Alfonzo Rivas & Cia. C.A., Ave. Vicente Lecuna, Esq. Petion, Edf. El Aguila, P.B., P.O. Box: 122, Caracas 1010-A, Venezuela. Tel.: 2-5762133, 2-5733422. Fax: 2-5747168. Telex: 21308 ARCIA VC.

Fungicides

Agrocros S.A., C/Velazquez, 140, 28006 Madrid, Spain. Tel.: 91-2616407; Fax: 91-2617904; Telex: 27589.

Nuodex Espanola S.A., Ave. Gran Via, 55, 28013 Madrid, Spain. Tel.: 91-2413496; Fax: 91-2475379; Telex: 44818 NUOD E.

Solvents and thinners

Agroindustrial Forestal Maderera A.R.I.C. de R.L., Prol. Paseo de Montejo No. 86 por, Calle 15, Mexico Norte, 97127, Merida, Yucatan, Mexico. Tel.: 99-277608, 99-277389; Fax: 99-277-389.

Polyethylene (high density)

Albany Equipos y Sistemas S.A. de C.V., Calle 6, No. 2559, Zona Industrial, 44940 Guadalajara, Jalisco, Mexico. Tel.: 36-122215, 36-124355; Fax: 36-124303. Telex: 681851 ALEX ME.

EXPORT OPPORTUNITIES

Titanium dioxide, industrial casein

Agropoland S. de R.L. de C.V., Attention: Janusz Grendys, Director General, Madrid 25, Del Carmen Coyoacan, P.O. Box 04100, Mexico, D.F., Mexico. Tel.: 5-6582855, 5-658-2538; Fax: 5-6582911. Telex: 177423 ODOME ME.

Sulphuric acid

Acumuladores del Noroeste S.A. de C.V., Cruz del Sur No. 10, Fracc La Joya Delega, La Gloria, 22710 Tijuana, B.C., Mexico. Tel.: 66-131326, Fax: 66-131327. Telex: 566598.

Pigments

Condutrade Internacional S.A. de C.V., Miguel de Cervantes Saavedra, No. 255, Ampliacion Granada, 11520 Mexico, D.F., Mexico. Tel.: 5-2505077, 5-2505300; Fax: 5-259151.

Polypropylene resins

A.B.B. Capacitores S.A., de C.V., Prol. Ingenieros Militares No. 96, San Lorenzo Tlaltenango, 11210 Mexico, D.F., Mexico. Tel.: 5-5766900; Fax: 5-3600940; Telex: 1772077 ABBC ME.

Agroempaques S.A. de C.V., Servo Diaz No. 17-3, Ladron de Guevara, 44680 Guadalaraja, Jalisco, Mexico. Tel: 36-157376, 36-157378; Fax: 36-157381; Telex: 682150 AGRO ME.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Balmer Lawrie & Co. Ltd., Attn: Deputy Gen. Manager (O), Leather Chemicals Division, Manali, Madras 600 068.	Caustic lye Liquid chlorine	Rs. 25 lakhs Rs. 11 lakhs	LCD/LYE/01 LCD/CL2/02	26.6.92 "
(Last date for sale of tender form — Rs. 100 per document — is 25.6.92)				
Hindustan Latex Ltd., Attn: General Manager, Trivandrum - 5, Kerala.	Silicone oil	75 MT	HL/PS/6/92-93	22.6.92
(Last date for sale of tender form — Rs. 110 per document — is 22.6.92).				
Hindustan Zinc Ltd., Attn: The Chief Manager (MP) Materials Division, Yashad Bhavan, Udaipur 313 001. Rajasthan.	Cresylic acid (import origin) containing m-cresol 40-42% Sodium silicate Zinc sulphate	125 MT 405 MT 830 MT	COMP(N)/19/ ZWM/581(91) COMP(R)/20/RA/ 509(92) COMP(R)/28/RD/ 511(92)	25.6.92 26.6.92 26.6.92
(Last date for sale of tender form — Rs. 120 per document — is 22.6.92. Earnest money for Cresylic acid Rs. 45,00 for sodium silicate Rs. 15,000 and for zinc sulphate Rs. 79,000). (Tender forms are also available from their offices Calcutta, Bombay and New Delhi.				
Indian Petrochemicals Corpn. Ltd., Attn: Sr. Materials Manager, Maharashtra Gas Cracker Comp., Division, Nagothane, Dist. Raigad, Maharashtra.	UHP acetylene gas UHP nitrous oxide gas	30 Cyls. 20 Cyls.	GCC/MM/91/50/ 5054 GCC/MM/91/50/ 5057	29.6.92 29.6.92
(Last date for sale of tender form — Rs. 50 per document — is 22.6.92).				
The Mysore Paper Mills Ltd., Attn: Manager (Materials), Paper Town, Bhadravati 577 302, Shimoga Dist., Karnataka.	Double refined roll sulphur	300 MT	FMT:307:PLR:92	20.6.92
(Tender forms — Rs. 108 per document — are also available from their office at Bombay).				
National Thermal Power Corporation Ltd., Attn: Dy. General Manager (M), Materials Management Dept., Badarpur Thermal Power Station, Badarpur, New Delhi 110 044.	Alumina ferric Hydrated lime	1500 MT 100 MT	BTPS/PUR/P4/ 92-93/01	8.7.92 10.7.92
(Last date for sale of forms — Rs. 200 per document — is 4.7.92. Earnest money deposit for alumina ferric Rs. 50,00 and for hydrated lime Rs. 25,000).				
Oil India Ltd., Attn: Chief Materials Manager, P.O. Duliajan, Assam 786 602.	Oil soluble demulsifier Ferrochrome ligno sulphonate	70 MT 60 MT	CC-2323 CC-2325	13.8.92 "
(Last date for sale of tender form — Rs. 750 per document — is 12.8.92. Tender forms are also available from their office at Calcutta and New Delhi).				

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
OFFERS FOR SALE				
The Indian Turpentine & Rosin Co. Ltd., Attn: Gen. Manager, P.O. Clutterbuckganj 243 502, Bareilly, U.P.	Rosin and its derivatives, terpene chemicals, varnishes, phenyle, disproportionated rosin and industrial alcohol			20.6.92
(Earnest money deposit Rs. 30,000; Cost of tender form Rs. 200)				
PLANT, EQUIPMENT & MACHINERY				
National Biofertiliser Devt. Centre, Attn: The Director, Dept. of Agriculture & Coopn., Ministry of Agriculture C.G.O. Complex II, 204, B-Wing, Kamla Nehru Nagar, Ghaziabad 201 002. (Cost of tender form Rs. 20)	B.O.D. incubator, mechanical rotary shakers, binocular research microscope, vertical autoclaves, laminar air flow.			19.6.92
Rashtriya Chemicals & Fert. Ltd., Attn: Ch. Materials Manager, Thal Unit, P.O. RCF Thal, Taluk: Alibag, Dist. Raigad, Maharashtra 402 208.	Gas/Gas heat exchanger	2 Nos.	Thal/Pur/AN 25920	4.7.92
(Last date for sale of tender form — Rs. 500 per document — is 20.6.92. Earnest money deposit Rs. 57,500).				
PLANT & MACHINERY FOR SALE				
State Fertilizer Manufacturing Corpn. (Under Liquidation), Attn: Liquidator, Sapugaskanda, Kelaniya, Sri Lanka.	Ammonia/Urea complex			31.8.92
(Naphtha based ammonia plant is of the Kellogg design and of capacity 545 tonnes of anhydrous ammonia/day. The urea plant is of Stamicarbon design and of capacity of 940 tonnes of prilled urea per day). (Tender forms are also available from the Chairman, Tender Board, Sri Lanka and also at Sri Lanka Missions overseas).				
TRANSPORT				
Indian Oil Corporation Ltd., Attn: Sr. Materials Manager, Materials Department, Haldia Refinery, Haldia, West Bengal.	Transportation of liquid ammonia from FCI, Sindri; SAIL, Rourkela, Hindustan Lever Ltd., Haldia, HFC, Baruani/Durgapur/Haldia to Haldia refinery site. (Approximately 400 MT)		HM/TRPT/401/ 92-93	26.6.92
	Transportation of liquid toluene 1000 MT from Gujarat refinery to Haldia refinery site. (Approximately 100 MT)		HM/TRPT/402/ 92-93	26.6.92
(Tender forms — Rs. 200 per document — will be sold upto 26.6.92. Earnest money deposit for transport of liquid ammonia is Rs. 10,000 and for liquid toluene Rs. 25,000).				

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Appro sailing (5)
			JNPT PORT (NHAVA SHEVA)	
16/6	Nikita Mitchenko (V-175)	Transocean/ Samrat/	La Spezia; Genoa; Marseilles; Barcelona and All Italian/French/Spanish & E. Med. Ports. (Carting at Kalamboli Shed No. 1B for Samrat & Shed No. 6 for Transocean).	18/6
		C.M.B./ Merzario/	Le Havre; Benelux; La Spezia; Genoa; Marseilles; Barcelona and all Italian/French/Spanish & E. Med. Ports; Jeddah; Djipouti. (Carting at Kalamboli for both).	
		L. Triest/	Genoa; Leghorn; La Spezia; Naples; Barcelona; Marseilles; Tunis. (Carting at Kalamboli Shed No. 4B).	
		Seaspeed/	La Spezia; Genoa; Barcelona; Leghorn; Fos; Marseilles. (Carting at Kalamboli 3C).	
		Patvolk	Genoa; Marseilles; La Spezia; Barcelona. (Carting at Kalamboli).	
17/6	Rijeka Express (V-13/92)	Oceanic/	Jeddah; P. Said; Trieste; Venice; Rijeka; Koper & Mediterranean Ports. Annaba/Oran (Algiers). (Carting at 3B Kalamboli).	19/6
		L. Triest	Trieste; Piraeus; Istanbul; Izmir; Mersin; Alexandria; Beirut; Limmassol; Malta; Budapest; Venice; Ravenna; Ancona. (Carting at Kalamboli Shed No. 4B).	
16/6	Nikita Mitchenko (V-175)	Samrat/ L. Triest	Boston; New York; Baltimore; Norfolk; Charleston; P. Mouth; Laudurdale; Miami; New Orleans; Savannah; Jacksonville; P. Everglades; Halifax; Montreal; Toronto. (Carting at Kalamboli Shed No. 1B for Samrat and 4B for L. Triest).	18/6
17/6	Rijeka Express (V-13/92)	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast; Montreal and Toronto. (Carting at 3B Kalamboli).	19/6
16/6	Nikita Mitchenko	Seaspeed	West African Ports. (Carting at Kalamboli Shed No. 3C).	18/6
17/6	Rijeka Express	L. Triest	Lagos; Tema; Abidjan; Dakar; Douala; Ponte Noire. (Carting at Kalamboli No. 4B).	19/6
			BOMBAY PORT	
15/6	Makalu (Voy-709)	Greenways	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon; Manchester; Avonmouth; Bremen; Belfast and all destinations in U.K.; Germany; Switzerland; Austria & Scandinavian Ports. (Carting at F-PD).	18/6
		Arebee/	P. Said; Alexandria; Piraeus; Venice; Trieste; Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Revenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). (Carting at M.O.D. No. 1).	
		M.C.S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapest; Russia. (Carting at M.O.D. No. 2).	
		POL India/	Thames Port (London); Manchester; Liverpool; Birmingham; Hamburg; Bremen; Rotterdam; Antwerp; Le Havre; Gdynia; Gdansk; Aarhus; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Other Poland inland destinations; Genoa; Naples; Valencia; Izmir; Marseilles; Barcelona; Alexandria; Lattakia; Mersin; Damietta; Beirut; Haifa; Ashdod. (Carting at Timber Pond No. 3).	
		J. Mackintosh/	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
		P&O	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liveropool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagan; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at T.P. No. 4).	

(1)	(2)	(3)	(4)	(5)
21/6	Ilovik	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4.	24/6
25/6	Lanka Abhaya (V-27/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	28/6
18/6	Ravidas	S.C.I.	Aden.	22/6
15/6	Baltik	Oceanic	Jeddah (Aqaba); Rijeka.	20/6
13/6	Hafez	J.M. Baxi	Bandar Abbas; Bandar Khomeini.	18/6
15/6	Makalu (Pan) (Voy-709)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sacramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas. Various inland destinations. (Carting at F-PD).	18/6
		Marine Trans/	South & Central American Ports. (Carting at E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Oakland; New Orleans; San Francisco; S. American Ports. (Carting at M.O.D. No. 2).	
		Arebee/	Halifax; Montreal; Toronto; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas; Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tiuana; Veracruze; Mexico; Sao Francis Do Sul; Carribbean; Central & South American Ports. (Carting at M.O.D. No. 1).	
		P&O	New York; Baltimore; Norfolk; Savannah; Charleston; Houston; & South American Ports. (Carting at T.P. No. 4 for P&O).	
16/6	Vermilion Bay (V-37 A/B)	O.S.A./	New York; Philadelophia; Baltimore; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma & S. American & W. Indies Ports. (Carting at B. Pier Extn.).	24/6
		Contfreight/	New York; Wilmington; Charleston; Baltimore; Savannah; Norfolk; Philadelphia; Los Angeles; San Francisco; Oakland; Seattle. (Only FCL). (Carting at Frere Basin).	
		U.L.A.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; West Indies Ports. (Carting at B-PD).	
17/6	Trade Fast (Voy-FAS-001)	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orleans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American & Pacific Ports. (Carting at B-PD).	20/6
		Trident	S. American; Caribbean and Central American Ports. (Carting at 12B-ID).	
13/6	Vega (Voy-36A/B)	O.S.A./	Sydney; Melbourne; Auckland; Wellington; Lyttleton; P. Chalmers. (Carting at B. Pier Extn.).	19/6
16/6	Vermilion Bay (V-37 A/B)	L. Triest/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at Frere Basin No. 1).	24/6
		Contfreight/	Melbourne; Sydney. (Carting at Frere Basin).	
		U.L.A.	Fremantle; Sydney; Melbourne; Adelaide; Brisbane. (Carting at B-PD).	
17/6	Trade Fast (Voy-FAS-001)	J. Mackintosh/ Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 2 for J. Mackintosh) (Carting at 12B-ID for Trident).	20/6
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S./	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari	Melbourne; Sydney; Brisbane. (Carting at F.B. No. 3).	
21/6	Ilovik (V-16) (Cyp)	Arebee/	Dar Es Salaam & Mombasa (Direct); Re Union; Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre (Malawi); Maputo; Walvis Bay (Namibia); Zanzibar. (Carting at M.O.D. No. 1).	24/6

(1)	(2)	(3)	(4)	(5
		P&O	Mombasa; Dar Es Salaam (Direct); Beira; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blangtyre. (Carting at T.P. No. 4).	
13/6	Vega	O.S.A.	P. Louis; Re Union; Tamatave. (Carting at B. Pier Extn.).	19/
17/6	Banglar Moni	Sai Ship	Mombasa; Dar Es Salaam (Direct); Zanzibar; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at M.O.D. No. 2).	19/
15/6	Allamanda (V-004)	G.O.S.	P. Louis; Re Union; (Tamatave). (Carting at F.B. No. 1).	21/
17/6	Stamford (V-41 W/E)	F.F.C. Co./ Silvership	Colombo. (Carting at Timber Pond No. 1). Chittagong; Rangoon. (Carting at Frere Basin No. 1).	19/
21/6	Ilovik	P&O	Colombo. (Carting at Timber Pond No. 4).	24/
15/6	Makalu (V-709)	Greenways/	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at F-PD).	18/
		M.C.S.	Far East & Japan Ports. (Carting at M.O.D. No. 2).	
17/6	Stamford (V-41 W/E)	F.F.C. Co./	Singapore; Jakarta; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at T.P. No. 1).	19/
		Samrat	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo; Haipong; Ho Chi Minh City. (Carting at B-PD).	
13/6	Vega/ (V-36 A/B)	O.S.A./	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Carting at B. Pier Extn.).	19/6
16/6	Vermilion Bay (V-37 A/B)	M.S.P.L./	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Surabaya. (Carting at F.B. No. 5 & 6).	24/6
		Contfreight/	P. Kelang; Singapore; Kaohsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Only FCL) (Carting at Frere Basin).	
		U.L.A.	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese Ports. (Carting at B-PD).	
17/6	Trade Fast (V-FAS-001)	J. Mackintosh/	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang;Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Matar; Yokohama; Nagoya; Kobe; Ho Chi Minh; Main Chinese Ports. (Carting at Frere Basin No. 2).	20/6
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohisung; Singapore. (Carting at 12-BID).	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at B-PD).	
		Silvership/	Far East Ports. (Carting at F.B. No.1).	
		Beacon/	Far East; Japan Japan & Chinese Ports. (Carting at E-Shed Grain Depot).	
		Lucky Mari	Singapore; Penang; P. Kelang; Bangkok; Manila; Surabaya; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kaohsiung; Keelung; Busan; & Chinese Ports. (Carting at F.B. No. 3).	
10/6	Pravdinsk	Transocean	Singapore; Main Japan Ports; Vladivostock.	19/6
15/6	Song Duong	J.M. Baxi	Bangkok; Penang; Jakarta. (Also loads at Bedi)	18/6
11/6	S/o. Tripura	S.C.I.	Singapore; Main Japan Ports.	19/6

VESSELS DUE FOR IMPORT DISCHARGE (BOMBAY)

Due Date	Steamer's Name	Agents	From
	JNPT (NHAVA SHEVA) PORT		
16/6	Nikita Mitchenko (V-175)	Transocean/L. Triest/ Merzario/Samrat/CMB	Med. Ports
	BOMBAY PORT		
21/6	Ilovik (V-16)	Arebee/P&O	E. Africa
16/6	Vermillion Bay (V-37 A/B)	OSA/ULA/Contfreight/ M.S.P.L.	Far East

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

DYES & DYE INTERMEDIATES IMPORTED BOMBAY (30.4.92)

(Continued from previous issue)

TOBIAS ACID: From China: Mahavir Intermediates, 17,500 Kgs., Rs. 14,75,074; Monarch Dyestuff Industries, 36,000 Kgs., Rs. 26,47,802; From Hong Kong: Jansons International, 17,000 Kgs., Rs. 16,30,611.

ULTRAPHOR RN LIQUID: From Germany: Ashok Fashion Fabrics P. Ltd., 210 Kgs., Rs. 1,90,570; Shree Shantinath Texterisers, 210 Kgs., Rs. 1,71,672.

ULTRAPHOR RN LIQUID/OPTICAL WHITENER: From Germany: Surat Fashions Ltd., 210 Kgs., Rs. 2,01,904.

PLASTIC MATERIALS IMPORTED BOMBAY (30.4.92)

HDPE: From Canada: Polychroic Inds., 10 Mts., Rs. 2,00,953; From Japan: A. Patwe Sons & Co., 64.4 Mts., Rs. 14,51,534; From Korea: Bajaj Polymers, 32 Mts., Rs. 7,45,646; Bombay Synthetics P. Ltd., 48 Mts., Rs. 10,49,349; Jewel Polymers, 16 Mts., Rs. 3,61,852; Kamdar Impex, 16 Mts., Rs. 3,77,016; Leyland House, 96 Mts., Rs. 19,66,204; Prince Marketing, 16 Mts., Rs. 3,52,336; Safire International, 16,000 Kgs., Rs. 3,67,339; The Supreme Industries Ltd., 160 Mts., Rs. 36,16,886.

HDPE: From Saudi Arabia: Ballarpur Industries Ltd., 49.5 Mts., Rs. 9,85,196; Jyothi Impex, 17.150 Mts., Rs. 4,03,079; Konkan Plastics, 11.115 Kgs., Rs. 2,71,828; Mipak Plastics P. Ltd., 34,300 Kgs., Rs. 6,39,702; From Saudi Arabia: Multi Films Plastics P. Ltd., 34.300 Mts., Rs. 8,66,075; National Exports, 49.5 Mts., Rs. 9,95,508; National Plastic Industries, 67.950 Mts., Rs. 13,69,017; Popatlal Mavji & Sons, 17,150 Kgs., Rs. 4,19,420; Safire International, 16,500 Kgs., Rs. 3,79,941; Shailesh Engineering, 17.150 Mts., Rs. 4,03,079; Sidheseva Exports, 148.500 Mts., Rs. 29,42,605; From USA: Bijal Trading, 17.500 Mts., Rs. 3,48,927; Interplast Inds., 52.5 Mts., Rs. 10,58,835; Overseas Trading Corpn., 17,000 Kgs., Rs. 3,46,717; Prince Plastics, 17 Mts., Rs. 4,01,485; Ratnajeet Polycon P. Ltd., 17.500 Mts., Rs. 3,61,281; Shah Patel & Co., 17.75 Mts., Rs. 3,78,833; Vishal Plastic Inds., 52.500 Mts., Rs. 10,00,473; From Yugoslavia: Associated Plastic Inds., 5 Mts., Rs. 1,24,236;

Himalaya Drug Co., 20 Mts., Rs. 4,97,831; Jyothi Impex, 5 Mts., Rs. 1,24,267; Kalpesh Plastic Inds., 9 Mts., Rs. 2,23,539; Kapi Chem Dye, 15 Mts., Rs. 3,72,777; Milton Plastics, 10 Mts., Rs. 2,28,432.

HOMOPOLYMER: From Yugoslavia: Essel Packaging Ltd., 31,000 Kgs., Rs. 7,53,548.

LDPE: From Canada: New Plastomers India Ltd., 45 Mts., Rs. 8,71,269; From Germany: Unique Pharmaceuticals Labs., 17,000 Kgs., Rs. 4,73,347; From Qatar: Bankim Industries, 4.5 Mts., Rs. 89,837; Finolex Cables Ltd., 132 Mts., Rs. 31,86,264; Godrej Soaps Ltd., 27.5 Mts., Rs. 6,08,055; From USA: Naresh Paper Bag Co., 38.556 Mts., Rs. 6,95,588; From Yugoslavia: B.M. Plastochem, 15 Mts., Rs. 3,58,533; Prince Plastics, 50 Mts., Rs. 11,07,404; Shree Maruti Combines, 20 Mts., Rs. 4,78,124; Shriram Chemicals, 18 Mts., Rs. 4,24,526.

LLDPE: From Canada: Monofil Plastics, 20.380 Mts., Rs. 3,27,050; New Plastomer India P. Ltd., 75,000 Kgs., Rs. 14,52,114.

POLYACETAL RESIN: From Korea: D.R. Polymers P. Ltd., 20,500 Kgs., Rs. 8,15,803.

POLYPROPYLENE: From Australia: National Organic Chem. Inds., 208.50 Mts., Rs. 40,75,904; Sanghi Filaments P. Ltd., 32.5 Mts., Rs. 7,74,174; From Austria: J.K. Synthetics Ltd., 16,250 Kgs., Rs. 3,84,507; From Belgium: Ishwar Ashish Plastics P. Ltd., 30 Mts., Rs. 6,21,084; Vikram Plastics, 45 Mts., Rs. 9,31,626; From Korea: Consolidated Plastics, 16 Mts., Rs. 3,08,553; Jai Fibres Ltd., 54 Mts., Rs. 12,96,177; From Korea: Koluthara Exports P. Ltd., 93 Mts., Rs. 15,19,458; Naresh Paper Bag Co., 9 Mts., Rs. 1,94,880; Prince Plastics, 22.375 Mts., Rs. 4,95,859; Sapana Polyweave P. Ltd., 15 Mts., Rs. 3,25,177; Sawant Food Products Ltd., 62 Mts., Rs. 8,95,734; Swati Growth Fund Ltd., 32 Mts., Rs. 7,14,120.

POLYSTYRENE: From China: In Swing Ltd., 18 Mts., Rs. 3,64,0 From Korea: Allied Instruments P. L 17,000 Kgs., Rs. 3,41,338; Joshi F mulabs P. Ltd., 34 Mts., Rs. 6,96,6 Vidyut Metallics Ltd., 51 Mts., 11,46,342; From Saudi Arabia: He Chemicals P. Ltd., 2.125 Mts., 41,852; From Taiwan: Indo Swing Lt 18 Mts., Rs. 4,40,208.

PVC RESIN: From Brazil: Radia Cables Ltd., 88,181 Kgs., R 18,37,589; From France: Caprihans Ltd., 32,000 Kgs., Rs. 9,03,059; Fro Korea: Ajay Plastic Inds., 102 Mts., R 17,55,567; API Polymers I Ltd., Mts., Rs. 8,77,784; Bhor Industri Ltd., 22.441 Mts., Rs. 5,79,800; Kum Exports, 24.600 Mts., Rs. 4,33,63 Mahan Plastics P. Ltd., 85 Mts., R 14,63,006; From USA: Premier Vin Flooring Ltd., 85 Mts., Rs. 12,47,50

SYNTHETIC RESIN: From US Pap-Flon Engg. Co., 99.80 Kgs., R 88,214.

VINYL COPOLYMER RESIN From Japan: Coates of India Ltd., Mts., Rs. 2,81,085.

MATERIALS EXPORTED BOMBAY (From 2.4.92 To 5.4.92)

ALUMINIUM CHLORIDE: T Kaohsiung: Transpek Marketing Ltd 18,000 Kgs., Rs. 3,70,134.

ALUMINIUM CHLORID ANHYDROUS: To Keelung: Bas Metal Chlorinations P. Ltd., 18,00 Kgs., Rs. 3,55,200.

ALUMINA HYDROXIDE: T Mombasa: Indian Products Trading C P. Ltd., 21 Mts., Rs. 5,81,798.

4 AMINO 1,1 AZOBENZENE SULPHONIC ACID: To Antwer Sandoz (India) Ltd., 1,022 Kgs Rs. 1,49,605.

AURAMINE: To Tilbury: Satyava Chemicals, 1,000 Kgs., Rs. 1,17,135

6 BROMO 2, 4 DINITRO ANILINE: To Piraeus: Pridor Chemicals & Extractions, 20 Kgs., Rs. 1,28,270.

CAUSTIC SODA: To Dubai: Gujarat Alkalies & Chemicals, 2,00,000 Kgs., Rs. 19,34,920.

CETYL ALCOHOL: To Felixstowe: Aegis Chemical Inds. Ltd,, 45,000 Kgs., Rs.16,28,211; To Long Beach: Aegis Chemical Ind. Ltd., 45,000 Kgs., Rs. 71,05,223; To New Jersey: Aegis Chemical Inds. Ltd., 15,000 Kgs., Rs. 5,91,495.

CHLORO ACETYL CHLORIDE: To Hamburg: Transpek Industries Ltd., 3,000 Kgs., Rs. 1,62,654; To Keelung: Transpek Industries Ltd., 18,000 Kgs., Rs. 8,91,536.

CHLORO METHYL NITROBENZENE: To New York: Sanvin Exports, 1,820 Kgs., Rs. 11,45,200.

DIAMINO STILBENE: To New York: Vasant Chemicals, 9,585 Kgs., Rs. 17,44,669.

DI NITRO CHLORO BENZENE: To Barcelona: Chemie Synth P. Ltd., 21 Mts., Rs. 4,25,405; To Charleston: Chemie Synth P. Ltd., 20 Mts., Rs. 6,07,858.

DINITRO ORTHO TOLUAMIDE BP: To Antwerp: Euro Asian Inds., 2,000 Kgs., Rs. 3,32,500.

FERROUS AMMONIUM SULPHATE HEXAHYDRATE: To New York: Belami Fine Chem P. Ltd., 1 Mt., Rs. 1,02,590.

FURFURAL: To Dubai: Oswal Agro Furane Ltd., 33,320 Kgs., Rs. 10,25,544.

GELATINE: To New York: Raymon Glues & Chemicals, 14,500 Kgs., Rs. 14,41,474.

GLYCERINE REFINED: To Liverpool: Gujarat Godrej Innovative Chem., 39,000 Kgs., Rs. 10,64,408.

GUAR GUM: To Charleston: Indian Gum Inds. Ltd., 19,051 Kgs., Rs. 3,72,114.

GUM EDIBLE: To Felixstowe: Eastern Overseas Corpn., 400 Kgs., Rs. 43,000.

GUM GHATTI: To Hamburg: Laxmi Enterprises, 18,000 Kgs., Rs. 5,71,823; To New York: Indrajit Company, 18,000 Kgs., Rs. 4,84,832.

GUM GHATTI SUPERFINE: To Rotterdam: Mahavir Trading Co., 5 Mts., Rs. 3,13,000.

GUM GUGAL: To Beirut: Haji Busain Tale Lari, 2,500 Kgs., Rs. 22,377.

GUM KARAYA: To Baltimore: D.K. Enterprises, 18 Mts., Rs. 15,35,000; To Felixstowe: Jethabhai Hirji & Co., 16 Mts., Rs. 12,92,000.

HYDROCORTISONE SODIUM SUCCINATE: To Colombo: Neon Laboratories P. Ltd., 2,053 Kgs., Rs. 7,48,672.

INSECTICIDE: To Santo Tomas: United Phosphorus Ltd., 13,200 Kgs., Rs. 24,84,889.

LAURENTS ACID DRY: To Barcelona: Atul Products Ltd., 7,375 Kgs., Rs. 11,16,082.

LEMON CHROME: To Colombo: Sudarshan Chemical Inds. Ltd., 500 Kgs., Rs. 33,938.

MAGNESIUM TRISILICATE: To London: Amrit International Ltd., 4,827 Kgs., Rs. 1,82,075.

MALATHION 57%: To Abudhabi: M.J. Exports Ltd., 2,000 Ltrs., Rs. 1,66,921.

MALEIC ANHYDRIDE: To Genova: Adarsh Chemicals & Fertilisers, 72,000 Kgs., Rs. 16,77,464.

MANGANESE DIOXIDE: To Jakarta: Union Carbide India Ltd., 36 Mts., Rs. 10,79,579.

MANGANESE DIOXIDE POWDER: To Keelung: Industrial Chemicals Agencies, 21,000 Kgs., Rs. 1,53,705.

MENTHOL SMALL CRYSTALS BP USP: To Hamburg: Bhagat Impex P. Ltd., 2,000 Kgs., Rs. 11,14,000.

META NITRO BENZENE SULPHONIC ACID: To Bangkok: Tata Exports Ltd., 10,000 Kgs., Rs. 3,30,240.

2 METHYL 5 NITRO IMIDAZOLE: To Gdynia: Unichem Labs. Ltd., 10 Mts., Rs. 22,52,000.

MIDDLE CHROME, LEMON CHROME: To Mombasa: Raveshia Chemicals, 9,000 Kgs., Rs. 3,91,840.

NAPHTHA: To Eden: Indian Oil Corporation Ltd., 30,600 Kgs., Rs. 14,99,60,770.

NAPHTHALAMINE TRISULPHONIC ACID: To Keelung: Sunbeam Monochem P. Ltd., 8,000 Kgs., Rs. 11,86,730.

NICOTINE SULPHATE: To Rotterdam: Urvakunj Nicotine Inds., 14,850 Kgs., Rs. 32,02,120.

NITRO AMINO PHENOL: To Antwerp: Sandoz Ltd., 3,997 Kgs., Rs. 6,13,357.

ORTHO CHLORO PARA NITRO ANILINE: To Piraeus: Ind. Extraction Ltd., 500 Kgs., Rs. 8,10,067.

ORTHO PHENYLENE DIAMINE: To Antwerp: Brinda Export Agencies, 200 Kgs., Rs. 34,000.

PARA CHLORO BENZENE SULPHONYL UREA: To Felixstowe: Latin Rasayani P. Ltd., 2 Mts., Rs. 4,17,000.

PARA CHLORO ORTHO NITRO ANILINE: To Felixstowe: Aarti Organics Ltd., 3,010 Kgs., Rs. 2,63,000; To New York: International Business Service, 3,000 Kgs., Rs. 2,70,675.

PARA TOLUENE SULPHONAMIDE: To Manchester: Latin Rasayani P. Ltd., 6,000 Kgs., Rs. 3,00,000.

PHOSPHORUS TRICHLORIDE: To Busan: Excel Inds. Ltd., 38,400 Kgs., Rs. 10,70,658.

POTASSIUM CITRATE: To New York: G. Amphray Labs., 20,000 Kgs., Rs. 8,86,549.

POTASSIUM PERMANGANATE: To Rotterdam: Universal Chemicals & Inds., 18,000 Kgs., Rs. 7,88,475.

PRINTING GUM: To Buenos Aires: Sandoz Ltd., 5 Mts., Rs. 2,49,342.

RED OXIDE, BLACK OXIDE: To Jeddah: Selective Minchem & Colour Inds., 20 Mts., Rs. 1,21,900.

RED OXIDE, BLACK OXIDE, BLUE OXIDE, GOLDEN YELLOW: To Jeddah: Selective Minchem & Colour Inds., 13,600 Kgs., Rs. 1,29,658.

SODIUM FORMALDEHYDE SULPHOXYLATE: To Felixstowe: Transpek Industries Ltd., 16,600 Kgs., Rs. 8,03,934; To Kaohsiung: Transpek Industries Ltd., 16,600 Kgs., Rs. 7,76,673.

SODIUM HYDRO SULPHITE: To Boston: Transpek Industries Ltd., 18,144 Kgs., Rs. 4,87,602; To Charleston: Transpek Inds. Ltd., 36,288 Kgs., Rs. 10,88,828; To Felixstowe: Transpek Inds. Ltd., 18 Mts., Rs. 5,32,540; To Jakarta: Transpek Inds. Ltd., 36,000 Kgs., Rs. 10,86,244; To Milwaukee: Transpek Inds. Ltd., 18,144 Kgs., Rs. 5,48,793; To Rotterdam: Transpek Inds. Ltd., 18 Mts., Rs. 5,36,674.

SULFAMIC ACID: To New York: The Dharamsi Morarji Chemical Co., 21 Mts., Rs. 3,33,053.

SULFOPHENYL CARBOXY PYRAZOLONE: To Keelung: Vivid Exports P. Ltd., 1,275 Kgs., Rs. 1,48,097.

SULPHONAMIDE MIXTURE: To Manchester: Latin Rasayani P. Ltd., 6,000 Kgs., Rs. 3,00,000.

THIONYL CHLORIDE: To Antwerp: Transpek Inds. Ltd., 18 Mts., Rs. 3,25,638.

THIONYL CHLORIDE MIN. 99%: To Busan: Transpek Inds. Ltd., 18,000 Kgs., Rs. 3,27,884.

VERAPAMIL HCl: To Colombo: Torrent Exports Ltd., 409 Kgs., Rs. 4,41,000.

ZINC OXIDE: To Felixstowe: Transpek Industries Ltd., 80,000 Kgs., Rs. 21,22,512; To London: Transpek Industries Ltd., 20,000 Kgs., Rs. 5,30,628.

DRUGS & DRUG INTERMEDIATES EXPORTED BOMBAY (From 2.4.92 To 5.4.92)

AMITRIPTYLENE: To Mombasa: Torrent Laboratories Ltd., 71,700 Kgs., Rs. 39,000.

AMOXYCILLIN TRIHYDRATE: To Antwerp: Ranbaxy Laboratories Ltd., 2,000 Kgs., Rs. 40,72,586; To Hamburg: Kopran Ltd., 1,000 Kgs., Rs. 20,04,000.

AMOXYCILLIN TRIHYDRATE BP 88: To Hamburg: Kopran Ltd., 2,000 Kgs., Rs. 40,07,000.

AMPICILLIN: To Hamburg: Ranbaxy Labs. Ltd., 1,639 Kgs., Rs. 12,49,320.

AMPICILLIN CLOXACILLIN: To Hamburg: Tini Pharma P. Ltd., 1,350 Kgs., Rs. 24,06,580.

AMPICILLIN TRIHYDRATE: To Antwerp: Ranbaxy Labs. Ltd., 1,000 Kgs., Rs. 18,70,064.

AMPICILLIN TRIHYDRATE BP 88: To Hamburg: Ranbaxy Labs. Ltd., 2 Mts., Rs. 37,78,639.

ANALGIN: To Copenhagen: Siris Ltd., 10,000 Kgs., Rs. 23,57,944; To Hamburg: Siris Ltd., 10,000 Kgs., Rs. 24,36,626.

BROMHEXINE HYDROCHLORIDE: To Hamburg: Ven Petrochem & Pharma P. Ltd., 500 Kgs., Rs. 7,70,190.

BULK DRUGS: To Colombo: IPCA Lab Ltd., 1,833 Kgs., Rs. 3,36,654; To Felixstowe: Menthol India P. Ltd., 2,160 Kgs., Rs. 2,55,714; To Hamburg: Hindustan Antibiotics Ltd., 25,578 Kgs., Rs. 30,48,621; Merind Ltd., 250 Kgs., Rs. 1,44,064; Unichem Labs Ltd., 150 Kgs., Rs. 46,000; Unichem Labs Ltd., 350 Kgs., Rs. 1,09,000.

CALCIUM GLYCEROPHOSPHATE: To Hamburg: Riddhi Exports, 2,500 Kgs., Rs. 5,66,561.

CEFATOXIME SODIUM USP: To Colombo: Neon Laboratories P. Ltd., 110 Kgs., Rs. 2,94,408.

CHLORAMPHENICOL: To Hamburg: Sureshchandra & Co., 1,500 Kgs., Rs. 22,71,782.

CHLORAMPHENICOL PALMITATE: To Antwerp: Mehta Pharmaceutical Inds., 1,000 Kgs., Rs. 13,97,000; To Rotterdam: Umedica Lab P. Ltd., 1 Mt., Rs. 13,44,323.

CHLORAMPHENICOL PALMITATE BP 88: To Hamburg: Mehta Pharmaceutical Inds., 1,000 Kgs., Rs. 14,10,000.

CHLORPHENIRAMINE BP: To Colombo: Bombay Drug House P. Ltd., 6,804 Kgs., Rs. 1,76,700.

DIGENE GEL: To Colombo: Boots Pharmaceuticals Ltd., 10,542 Kgs., Rs. 2,19,000.

DIMETRIDAZOLE: To Barcelona: Hildose, 1,500 Kgs., Rs. 4,00,000.

DIMETRIDAZOLE BASE BP: To Antwerp: Euro Asian Industries, 1,000 Kgs., Rs. 2,84,550.

DRUGS & DRUG INTERMEDIATES: To Hamburg: Aarti Drugs P. Ltd., 1,000 Kgs., Rs. 2,23,715; Aarti Drugs P. Ltd., 5,000 Kgs., Rs. 15,00,208; Metro Exporters Ltd., 2,000 Kgs., Rs. 3,54,528; Themis Agencies, 2 Mts., Rs. 29,14,531.

ERYTHROMYCIN ESTOLATE BP 88: To Hamburg: Mehta Pharmaceutical Inds., 500 Kgs., Rs. 8,55,960.

ERYTHROMYCIN STEARATE BP 88: To Hamburg: Mehta Pharmaceutical Inds., 1,000 Kgs., Rs. 16,59,000.

FRUSEMIDE BP 88: To Copenhagen: Cibatul Ltd., 1,000 Kgs., Rs. 13,99,058.

GENTAMYCIN SULPHATE: To Limassol: Eupharma Labs., 1,629 Kgs., Rs. 3,46,519.

GLYCINE USP: To Ankara: Fresco Corpn., 1,000 Kgs., Rs. 96,966.

IBUPROFEN BP 88: To Hamburg: Sumitra Pharmaceuticals & Chem., 33,750 Kgs., Rs. 95,78,404.

L-EPHEDRINE HCL USP: To New York: Enmellan Biotech Pharmaceuticals, 4 Mts., Rs. 45,47,998.

MEBENDAZOLE USP: To Hamburg: Rokadia Chemical Co. P. Ltd., 1,000 Kgs., Rs. 6,14,351.

METRONIDAZOLE BENZOATE IP: To Hamburg: Manjarati Chemicals, 2,500 Kgs., Rs. 12,32,858.

PARACETAMOL: To Singapore: Rhone Poulenc Ltd., 1,758 Kgs., Rs. 5,01,427.

PARACETAMOL BP: To Marseillses: G. Amphray Labs., 9,000 Kgs., Rs. 12,88,931.

PARACETAMOL POWDER BP: To Mombasa: A.P. Chemicals, 10,000 Kgs., Rs. 15,11,290.

PILOCARPINE NITRATE BP/USP: To Colombo: Industrial Trading Co., 306 Kgs., Rs. 6,54,000.

PYRAZINAMIDE BP 88: To Hamburg: Mahindra Exports Ltd., 1,000 Kgs., Rs. 9,06,000.

RIBOFLAVIN SODIUM PHOSPHATE BP: To Hamburg: Romeda Chemicals, 300 Kgs., Rs. 9,56,632.

SULPHAMETHOXAZOLE: To Hamburg: Siris Ltd., 3,300 Kgs., Rs. 9,90,026.

SULPHAMETHOXAZOLE: To Hamburg: Chemox Marketing Associates P. Ltd., 10,000 Kgs., Rs. 27,24,754; Siris Ltd., 6,700 Kgs., Rs. 20,09,974; Standard Organics Ltd., 10,000 Kgs., Rs. 30,69,677; To Rotterdam: Anant & Co., 5,000 Kgs., Rs. 15,16,534.

SULPHAMETHOXAZOLE BP 88: To Gdansk: Apte Amalgamations Ltd., 10 Mts., Rs. 33,92,437.

SULPHAMETHOXAZOLE USP: To New York: Standard Organics Ltd., 10,000 Kgs., Rs. 44,88,156.

TRIMETHOPRIM BP: To Felixstowe: Burroughs Wellcome (India) Ltd., 2,500 Kgs., Rs. 29,73,359.

PLASTIC MATERIALS EXPORTED BOMBAY (From 2.4.92 To 5.4.92)

LDPE: To Barcelona: Kanoria Chemicals & Inds., 26,000 Kgs., Rs. 71,42,263; To Chittagong: Indian Petrochemicals Corpn. Ltd., 1,48,500 Kgs., Rs. 25,84,431; To Colombo: Indian Petrochemicals Corpn. Ltd., 1,15,500 Kgs., Rs. 20,15,930; To Dubai: Indian Petrochemicals Corpn. Ltd., 16,000 Kgs., Rs. 2,79,263; To Singapore: Indian Petrochemicals Corpn. Ltd., 352 Mts., Rs. 49,48,745.

DYES & DYE INTERMEDIATES EXPORTED BOMBAY (From 2.4.92 To 5.4.92)

ACETANILIDE BASE: To New York: Sagar Drugs & Pharml. P. Ltd., 17,500 Kgs., Rs. 16,39,008.

ACID BLACK: To London: Colourtex Exports P. Ltd., 3 Mts., Rs. 4,96,675.

ACID BLACK 77: To Felixstowe: Ravi Chem Dye, 1 Mt., Rs. 1,53,181.

ACID RED: To Rotterdam: Karsandas Mavji, 1,500 Kgs., Rs. 2,10,445.

ACID VIOLET: To Rotterdam: Brinda Exports Agencies, 1,000 Kgs., Rs. 2,33,000.

ALIZARINE RED: To Rotterdam: Transpek Marketing Ltd., 2,000 Kgs., Rs. 9,69,664.

ANTHRAQUINONE: To Genova: Gujarat State Fertilisers Co., 15.2 Mts., Rs. 7,47,472; To New York: Mangalya Trading & Investments Ltd., 29,000 Kgs., Rs. 32,44,000.

ANTHRAQUINONE DISULPHONATE: To Antwerp: Indian Dyestuff Industries Ltd., 2 Mts., Rs. 5,0 ,000.

BRINDAZOL TURQUOISE BLUE: To Keelung: Brinda Export Agencies, 5,000 Kgs., Rs. 9,30,000.

C ACID: To Keelung: Vivid Exports P. Ltd., 4,699 Kgs., Rs. 7,88,757.

CHEM RED KC GR: To Karachi: Colour Chem Ltd., 7,500 Kgs., Rs. 9,37,500.

DIAMINO DIPHENYL SALT: To Istanbul: Jindal Dye Intermediate P. Ltd., 16,533 Kgs., Rs. 8,69,926.

DICHLORO ANILINE: To Felixstowe: Gemchem Industries, 1,020 Kgs., Rs. 90,000.

DICHLORO NITRO ANILINE: To Felixstowe: Amar Dye Chem Ltd., 4,000 Kgs., Rs. 5,17,171.

DIMETHYL SULPHATE: To Busan: Salvigor Labs. Ltd., 34,000 Kgs., Rs. 5,16,000.

DINITRO ANILINE: To London: Nanavati Services & Trades P. Ltd., 3,500 Kgs., Rs. 2,92,545; To New York: Nanavati Services & Trades P. Ltd., 12,879 Kgs., Rs. 11,59,440.

DIRECT BLACK: To Antwerp: Karsandas Mavji, 1,250 Kgs., Rs. 2,12,633; To Felixstowe: Megha Impex P. Ltd., 12,000 Kgs., Rs. 15,12,675.

DIRECT BLACK 22: To Rotterdam: Chitra Dyestuff Inds., 500 Kgs., Rs. 99,448.

DIRECT BLUE: To Felixstowe: Megha Impex P. Ltd., 2,000 Kgs., Rs. 2,16,928.

DIRECT BROWN DR: To Genoa: Golden Dyes Corpn., 2,300 Kgs., Rs. 2,60,000.

DIRECT CONGO RED H/C: To Rotterdam: Karsandas Mavji, 2,000 Kgs., Rs. 2,42,065.

DISULPHONATE: To Antwerp: Indian Dyestuff Inds. Ltd., 5 Mts., Rs. 12,59,000.

DISULPHONIC ACID: To Barcelona: Chemco International, 1,273 Kgs., Rs. 1,35,753; To Port Said: Gokul Enterprises, 4,080 Kgs., Rs. 6,20,778.

DYE INTERMEDIATES: To Antwerp: Atul Products Ltd., 6,500 Kgs., Rs. 9,69,414; Jayshree Chemical, 1,000 Kgs., Rs. 1,89,778; Vipul Dyes & Chemicals P. Ltd., 2,000 Kgs., Rs. 5,81,798; To Busan: Zenith Ltd., 21,974 Kgs., Rs. 33,47,336; To Colombo: Amritlal Chemaux Ltd., 1 Mt., Rs. 1,32,546; To East Africa: Saif Exports, 345 Kgs., Rs. 19,015; To Genoa: Navin Chemical Enterprises, 6,080 Kgs., Rs. 5,71,216; To Hamburg: Indchem Exports, 1 Mt., Rs. 5,65,000; 2 Mts., Rs. 1,38,000; 3 Mts., Rs. 17,10,000; Liberty Exports Ltd., 2 Mts., Rs. 3,56,005; Mangalya Trading & Investments Ltd., 6,525 Kgs., Rs. 14,83,800; Sadhana Nitro Chem Ltd., 5 Mts., Rs. 1,71,650; Vipul Dyes & Chem P. Ltd., 16 Mts., Rs. 38,80,000; To Istanbul: Chemie Inds., 6,900 Kgs., Rs. 3,32,692; 7,580 Kgs., Rs. 3,76,353; To Keelung: Vivid Exports P. Ltd., 10,200 Kgs., Rs. 12,25,828; 17 Kgs., Rs. 1,20,140; 18 Kgs., Rs. 1,24,695; 33 Kgs., Rs. 2,59,877; 223 Kgs., Rs. 7,83,007; 305 Kgs., Rs. 10,50,792.

DYE INTERMEDIATES: To Keelung: Vivid Exports P. Ltd., 5,111 Kgs., Rs. 5,95,570; To Rio de Janeiro: Fichem, 1,310 Kgs., Rs. 2,78,044; To Rotterdam: Indian Dyestuff Inds. Ltd., 412 Mts., Rs. 2,35,000; Jindal Dye Intermediates P. Ltd., 15,210 Kgs., Rs. 7,94,736.

DYES: To Alexandria: Jaysynth Dyechem Ltd., 200 Kgs., Rs. 68,312;

2,500 Kgs., Rs. 5,40,241; 4,000 Kgs., Rs. 7,06,469; 4,600 Kgs., Rs. 13,71,381; 6,000 Kgs., Rs. 8,86,549; To Antwerp: Blue Rock Dyes & Chem P. Ltd., 1 Mt., Rs. 2,47,074; 600 Kgs., Rs. 1,82,851; Jaysynth Dye Chem Ltd., 1,000 Kgs., Rs. 3,39,382; Megha Impex P. Ltd., 1 Mt., Rs. 1,77,310; Metro Chem Inds., 7,000 Kgs., Rs. 11,63,596; Vipul Dyes and Chemicals P. Ltd., 2,000 Kgs., Rs. 3,37,997; To Bandar Abbas: Mohan Exports Ltd., 2 Mts., Rs. 2,22,745; Mohan Exports Ltd., 2 Mts., Rs. 2,32,719; 3 Mts., Rs. 3,47,970; 4 Mts., Rs. 5,54,093; To Barcelona: Chemco International, 500 Kgs., Rs. 80,100; 1,500 Kgs., Rs. 3,13,500; Jaysynth Dye Chem Ltd., 1,300 Kgs., Rs. 3,45,903; Mangalya Trading & Investments Limited, 1,600 Kgs., Rs. 2,08,400; Ravi Chem Dye, 300 Kgs., Rs. 43,635; To Charleston: JBF Inds. Ltd., 13,300 Kgs., Rs. 22,16,373; To Colombo: Amritlal Chemaux Ltd., 1 Mt., Rs. 3,05,000; Indian Dyestuff Inds. Ltd., 1,000 Kgs., Rs. 3,73,000; Mangalya Trading & Investments Ltd., 2,790 Kgs., Rs. 3,13,000; To Felixstowe: Highland Dye Works, 3,000 Kgs., Rs. 8,40,000; Ravi Chem Dye, 1,020 Kgs., Rs. 1,93,049; Space International, 500 Kgs., Rs. 1,08,602; To Genoa: Jaysynth Dye Chem Ltd., 9 Mts., Rs. 26,31,943; 1,500 Kgs., Rs. 4,25,955; Rahul Dyechem Inds. P. Ltd., 24,000 Kgs., Rs. 35,11,456; United Chemie, 3,000 Kgs., Rs. 4,40,000; To Hamburg: Meghmani Dyes & Intermediates, 2,000 Kgs., Rs. 9,06,620; To Istanbul: Jansons International, 5,000 Kgs., Rs. 6,64,912; Meghmani Dyes & Intermediates, 13 Mts., Rs. 27,26,291; Shree Madhu Hans Impex P. Ltd., 300 Kgs., Rs. 64,413; Stallion Impex P. Ltd., 1,975 Kgs., Rs. 4,78,252; 1,990 Kgs., Rs. 4,72,172; 3,000 Kgs., Rs. 7,06,469; To Karachi: Colour Chem Ltd., 875 Kgs., Rs. 97,150; Colour Chem Ltd., 1,250 Kgs., Rs. 1,50,000; To Keelung: Vivid Exports P. Ltd., 1,000 Kgs., Rs. 1,61,798; To Liverpool: Jindal D Intermediate Limited, 600 Kgs., 1,37,140; Jindal Dye Intermediates L ited, 1,400 Kgs., Rs. 3,28,300; 2,(Kgs., Rs. 6,92,618; To London: Am lal Chemaux Ltd., 240 Kg Rs. 1,28,465; Colourtex Exports P. L 2,500 Kgs., Rs. 6,91,855; Formok Corpn., 6,000 Kgs., Rs. 9,35,000; R Chem Dye, 10,000 Kgs., Rs. 16,31,8 Saahil International, 1,000 Kg Rs. 4,80,495; To Mersin: Chemi Ind 400 Kgs., Rs. 69,262, Chemi Ind 1,000 Kgs., Rs. 2,14,711; Chemi Ind 1,000 Kgs., Rs. 2,17,024; 1,000 Kg Rs. 1,63,458; To Mersin Port: Chem Industries, 2,000 Kgs., Rs. 6,59,371; Mersin: Chemi Inds., 3,000 Kgs., R 7,97,894; 3,500 Kgs., Rs. 5,43,011; T Mombasa: United Exporters P. Ltd 1,500 Kgs., Rs. 37,000; To New York Arlabs Ltd., 1,500 Kgs., Rs. 13,05,00 Atul Products Ltd., 2,500 Kgs., R 4,22,052; 15,000 Kgs., Rs. 30,65,05 15,800 Kgs., Rs. 23,26,444; Jaysynt Dye Chem Ltd., 6,970 Kgs., R 26,44,078; 7,525 Kgs., Rs. 37,06,096 JBF Industries Ltd., 600 Kgs., R 94,196; Nandosal Inds., 7,000 Kgs., R 14,21,249; To Rotterdam; Imkeme India Ltd., 500 Kgs., Rs. 1,38,062 Indian Dyestuff Industries Ltd., 50 Kgs., Rs. 78,700; 550 Kgs., Rs 2,18,000; 1,000 Kgs., Rs. 5,46,000 1,500 Kgs., Rs. 8,19,000; 5 Mts., Rs 21,98,000; Jaysynth Dye Chem Ltd., Mt., Rs. 3,60,160; Meghmani Dyes & Intermediates, 3,500 Kgs., Rs. 8,77,545 4,900 Kgs., Rs. 7,81,222; Metro Chem Inds., 500 Kgs., Rs. 2,00,285; 10,600 Kgs., Rs. 14,12,550; 10,600 Kgs., Rs. 16,77,185; 11,000 Kgs., Rs. 14,15,321; Ravi Chem Dye, 500 Kgs., Rs. 77,299; 7,500 Kgs., Rs. 14,61,814; To Rotterdam: Siddharth Colorchem P. Ltd., 1 Mt., Rs. 2,16,087; 1,000 Kgs., Rs. 2,40,866; 2,000 Kgs., Rs. 4,87,272; To Thessalonik: Monarch Dye Inds., 500 Kgs., Rs. 1,08,130; 3,000 Kgs., Rs. 6,18,575; 5,500 Kgs., Rs. 10,94,334; 9,500 Kgs., Rs. 18,34,049; To Tilbury: K. Patel Chemo Pharma P. Ltd., 1 Mt., Rs. 3,72,000.

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The National Wind Energy Scene

WIND power is a form of solar energy — wind is formed when the sun shines on the earth and different amounts of heat are absorbed or reflected by land and water surfaces and clear or cloudy areas. Where the heating conditions are similar for a large area for extended periods of time, major high and low pressure systems are created. Wind is simply air in motion, moving from an area of high atmospheric pressure to one of low atmospheric pressure.

For power generation using wind energy areas that have wind speed of 18 kmph and above are chosen. In a plot of one sq.km about 90 windmills with a total capacity of 5 MW can be set up. They would produce 9 million units of power a year, enough to light up 1,000 numbers of 1,000 watt bulb for a year continuously.

Tamil Nadu and Gujarat have the best wind potential in the country. It is estimated that the two States alone have the capacity to generate 10,000 MW of wind-generated electricity. Besides, mountains and hills are known to cause stronger winds, if they form a gap or venturi in the direction of the already strong wind. The presence of such an accelerated wind has been confirmed in the Palghat and Aramboli gaps in Tamil Nadu.

Another possibility for higher installed capacity is to set up smaller wind turbines, along the electrical grids. For instance, in Tamil Nadu, there are about 75,000 distribution transformers along the grid. Even if only 20 per cent of these are assumed to be in the windy zone, about 15,000 wind electric generators with an average capacity of 200 KW each can be installed and connected to the transformers. This would not only save land, but also expenditure on electrical equipment and laying extension lines to the grid.

For power generation, experts say, a minimum wind speed of 18 kmph is necessary. In India, in March and April, the windspeed exceeds 10 kmph, reaching 15 to 20 kmph on the west and east coasts as also along the South Tamil Nadu coast. In May, they extend to cover western India and Tamil Nadu. In June, the velocity of the wind exceeds 10 kmph over almost the whole country. In July and August, they reach up to 30 kmph in coastal Gujarat and 25 kmph over Western India, South Tamil Nadu and the east coast. May, June and July alone account for nearly half of the annual wind energy availability.

The winds generally weaken from September, with only coastal Gujarat and South Tamil Nadu experiencing speeds ranging from 15 kmph to 20 kmph. Between October and February, winds exceeding 10 kmph are found only on the Gujarat, Konkan, South Tamil Nadu and Orissa-Bengal coast.

The first-ever compilation of wind energy data in India was published in 1983, under a project sponsored by the Department of Non-Conventional Energy Sources (DNES). But the handbook, based on information available from meteorological centres, could provide only a skimpy picture. The DNES, therefore, launched a programme in 1985 to collect finer details.

Under the project, 81 wind monitoring and 311 wind mapping stations have been set up so far, and 22 additional monitoring and 169 mapping stations are coming up. Besides, 'complex terrain' studies are being conducted to estimate the chances of power generation in inland areas endowed with strong winds. Mountains and hills are known to provide stronger winds if they form a gap or a venturi in the direction of already strong winds. Local wind systems can also result from differential heating of valley floors and mountain slopes. Advantage is also taken of stronger upper winds on low hills, located in otherwise flat terrains.

Interim reports of resources surveys, that are underway, indicate that 12 sites in Tamil Nadu, six in Gujarat, seven in Andhra Pradesh and two in Maharashtra have conditions (annual mean wind speed, power density and

energy content) favourable for power generation. According to data available with the DNES the wind power potential of the country is around 20,000 MW, while the Tata Energy Research Institute has estimated it to be of the order of 50,000 MW, with Tamil Nadu and Gujarat alone accounting for about 10,000 MW.

Indo-Soviet Co-operation: According to a protocol signed between India and the USSR in January 1991 in New Delhi, India and the USSR will take up a joint production programme in the wind energy sector to develop non-conventional energy sources. As part of this the production of stand-alone machines and medium to large grid-connected wind energy generators will be taken up. Besides, the two countries will also evolve a joint research, design and development programme for higher sizes (100 to 250 KW) of wind-electric generators.

They also agreed to explore the possibility of Indo-Soviet participation in wind energy projects in third countries. Also, the two countries will share developments and experience in this field to optimise utilisation of their present capabilities and facilities.

Wind energy is commonly used in water pumping and power generation. For pumping water, water pumping wind mills have been developed. And now they are the most efficient water pumps to lift water from deep sources. The "Green Rev" developed and manufactured by Natural Energy Processing Company (now NEPC-MICON Ltd.), one of the leading manufacturers of windmills in the country, is an example of an efficient water pump which can lift water from a depth of about 50 metres and discharge about 2,300 litres an hour. This windmill is provided with a gear box system for smooth operations. The cut-in wind speed of this water pump that is, the minimum wind speed required to operate, is 6 km/h and the cut-out wind speed, the maximum wind speed, 35 km/h. Beyond this wind speed, an automatic stopping mechanism protects the pump from damage. Because of its low cut-in speed this windmill can be installed anywhere in an open place or a farm. For functional efficiency this water pump is matched with a diesel pump of 3 HP.

The initial investment of the water pumping wind mill is less than Rs. 50,000 inclusive of installation charges and cost of components. This appears to be a little high when compared to a diesel pump. But once installed, the pumping operation is cost free all the way as no fuel expense is involved. The investment made can be recovered within 4-5 years. Against this, a diesel pump can be put to operation for only 4-5 hours a day and involves recurring running expenses towards cost of oi and regular maintenance.

In the power sector, wind energy has proved to be a suitable alternative source to the conventional systems. Rigorous world wide experimentation and research have paved the way for the introduction of wind turbine generators of 250 kW capacity. During 1986-89, wind farms consisting of 280 wind turbine generators were set up for an aggregate capacity of 40 MW. Great emphasis is laid by the Government on indigenisation as wind turbines are now imported. Efforts are on for local manufacture of wind turbines with knowhow from reputed foreign firms.

The economic viability of wind energy can be assessed from a comparative study of conventional systems. The high initial investment in the case of wind energy is compensated by cost-free running of windmill and low maintenance costs. The other favourable factor is the relatively short gestation period of 2-3 years for a large size wind power project against 5-10 years for conventional plants.

The various promotional incentives granted by the Government such as 100 per cent depreciation, exemption from customs duty on wind turbines, exemption from excise duty and sales tax for power generated by wind turbines make wind energy systems attractive.

The unit cost of power produced by wind turbines is high in the first year but comes down over a period of seven years to a meagre 40 paise whereas unit costs in the case of conventional systems varies depending on the cost of fuel and maintenance. The Table 1 shows the gradual reduction of unit cost of power production by wind turbine.

While installing wind turbine generators the first step is to identify the areas with high wind speeds. Once a wind turbine is installed, the power generated has to be carried to the consumption centres. For this purpose, power banking schemes are operated by many States. Under this, the power generated is banked with the State electricity grid. In times of power cut and other emergencies, the owners of wind turbines can draw requirements at any place of their choice within the State. The Electricity Board charges a nominal wheeling charges (two per cent in Tamil Nadu). The excess power can be sold to the Electricity Board or other consumers.

The potential for tapping wind energy in India is placed around 20,000 MW. The coastal area of Gujarat

is found to be a high wind potential area with about 500 MW and wind speeds of 22 kmph and above. In addition, there many sites in that State with wind speeds in the 15-20 kmph range. The eastern coast of Tamil Nadu, Andhra Pradesh, Orissa, Karnataka, Madhya Pradesh, Western Rajasthan, Uttar Pradesh and NorthWestern region of Himalayan and Sub-Himalayan ranges are found to be having wind velocity ranging from 15 kmph to 55 kmph. The National Aeronautical Laboratory, Bangalore, has found Kappta Hill in Karnataka to be the windiest site in the country.

Out of this enormous wind potential in the country only a fraction, say, 40 mw of wind energy is being harnessed. Though this is too small a quantity it is very significant in the context of the present energy crunch. In wind energy utilisation, Tamil Nadu and Gujarat account for the major share.

The latest Wind Farm in Tanil Nadu

Kayathar, where all the palm trees bend respectfully to the strong winds, is just one of the 12 windfarms spread in 7 states across the country. There is a 13th project also- a lone private sector windfarm near Kanyakumari, put up by Pandian Chemicals for captive generation. Still, total up that brings the total capacity of wind energy generators in the country to only 34 MW — barely 0.5 per cent of the installed capacity.

Except that, after the recent national symposium on wind energy development held recently at Madurai, the wind seems to be changing direction. Once the detailed discussions on the state of the technology and its commercialisation were over, what remained was the interest shown by several private companies to set up wind energy projects for captive consumption, and later perhaps, even as a utility.

Consider as a line-up:

RRB Consulting Engineers has teamed up with the leading Danish company Vestas, for manufacturing windmills. Actively carrying on its indigenisation programme, RRB has a licensed capacity of 30 MW and supplies parts to other manufacturers in the country.

Asea Brown Boveri has a collaboration with Danish Wind Power and has a license to make 22.5 MW machines in a year. Meanwhile, Madras-based Natural Energy Processing Company, which has collaborated with Micon of Denmark has a capacity of 15 MW per year.

Meanwhile, the TI group (of EID Parry and Carborundum Universal fame) and Larsen & Toubro are also interested in setting up wind energy projects. The latter, is in fact, on the verge of signing a collaboration with Windpower, USA, one of the largest wind turbine manufacturers in the world. "We have also commissioned a market study on the feaibility of a wind farm and may set up a 10 MW wind farm," says C.R. Ramakrishnan, Vice President and Managing Director. The cost: approximately Rs. 1.75 to Rs. 2 crore.

What has brought this sudden gust of interest? For one, the change has come from within the Government-policy makers have at last accepted that wind energy is worth investing in. In the Seventh Plan alone, the Government spent Rs. 600 crore for wind energy development, overshooting the budgeted Rs. 400 crore. And for the Eighth Plan, the Department of Non-conventional Energy Sources (DNES) has proposed a budget outlay of Rs. 875 crore.

The targets are equally ambitious. Considering that each mega watt of wind energy needs a capital investment of Rs. 1.75 crore without taking into account the cost of land— the DNES has targeted for a capacity of at least 500 MW of wind energy by the end of the Eighth Plan, to be further expanded to 3000 MW by the turn of the century.

But proving more attractive to the private sector is the incentive package being put together: a 100 per cent depreciation in the first year on all equipment bought; duty free imports of equipment and components; import under OGL; a provision to wheel the power generated at a concessional rate of 2 per cent; and a banking of power in the case of captive generation upto 3 months.

The final bait, of course, is that the power can even be sold to state electricity boards at a specified rate-for example, Rs. 1 per unit in Tamil Nadu and Rs. 1.25 in Gujarat. Says S. Satyavan, General manager and secretary of Pandian Chemicals, the sole private sector entrepreneur in the field for captive power generation: "In the first year alone our company made a tax saving of Rs. 1.25 crore."

And then there is the technology factor. The wind turbines of the present era are far removed from the wooden windmills of Holland used by farmers to grind corn. Today, they are made of steel and fibre-glass and are controlled and operated by computers. Needing only one person for maintenance for every 100 windmills, they can be safely left on their own. While initially machines of smaller capacity of 55 and 90 kilo watt were installed, the preference has now shifted to 200 to 250

Table 1
REDUCTION IN UNIT COST OF POWER FROM WIND ENERGY

Year	I	II	III	IV	V	VI	VII	VIII	IX	X
Without depreciation	1.00	0.94	0.83	0.72	0.61	0.51	0.40	0.32	0.33	0.35
With depreciation	10.38	0.95	0.84	0.73	0.62	0.51	0.40	0.32	0.33	0.35

Table - 2
WIND POWER PROGRAMME: CURRENT TRENDS

Installed Capacity	31.40 MW
Gujarat	13.95
Tamil Nadu	13.65
Maharashtra	1.10
Orissa	1.10
Andhra Pradesh	0.55
Karnataka	0.55
Madhya Pradesh	0.55
Under Implementation	5.07 MW
Gujarat	2.60
Tamil Nadu	1.92
Andhra Pradesh	0.55
Total no. of wind electric generators	286
Unit size	55-300 KW
Annual energy generation	2-2.5 mil. KWH/MW
Cumulative generation since commencement in 1986, with a capacity of 3.3 MW	55 million KWH
Average capital cost	Rs. 1.75-2.00 crore/MW
Average cost of generation	Re.1.00-1.25/KWH
Gestation period	Less than 1 year
Estimate of overall potential	20,000 MW
Planned capacity addition during 8th Plan	500 MW

kilo watt machines clustered in a group and connected to a grid. (The power from the wind turbines is generated at 415 volts and is stepped up to 11 kilovolts before being fed into the grid).

Significantly, the DNES is even trying to get the Central Electricity Act amended to do away with the tedious process of having to acquire land for setting up wind turbines.

Just about the only blight is that of indigenisation. With limited volumes and high raw material prices manufacturers still feel the constraints of the new technology. Their suggestions: a deemed, export status for indigenous manufacture and an extension of the 15 per cent subsidy for diesel gensets to cover wind turbines too. Says R. P. Gupta, of BHEL, which is also licensed to

Table - 3
NUMBER AND CAPACITY OF WIND ELECTRI GENERATORS (WEGs) INSTALLED

Location	WEG size				
	55KW	90KW	100KW	200KW	225K
Tuna	--	1	--	--	--
Okha	10	--	--	--	--
Lamba	--	--	--	50	--
Veraval	1	--	--	--	--
Dahanu	--	1	--	--	--
Deogarh	10	--	--	--	--
Sultanpet	--	1	--	--	--
Kayattar	--	15	--	6	6
Puliyankulam	--	1	--	--	--
Tuticorin	10	--	--	--	--
Kaipadar	--	1	--	--	--
Indore	--	1	5	--	--
	31	21	5	56	6

manufacture wind turbines: "We have indigenised 50 pe cent of the machine. If basic raw materials are mad available at international prices, another 20 per cent i easily possible."

That might be so, but the Government will again hav to make hard choices. While the symposium — and th enthusiastic response afterwards — did seem to clea the air, there is obviously a need to not only allay fears but foster the budding interest in the alternative form o energy; especially at a time when the country is facin not only a resource crunch, but also an oil crisis. This is one option that can't blow away in the wind.

Gujarat

Asia's longest Wind Farm became operational i Gujarat in September '91. Gujarat, faced with an impending power shortage that could cripple its industrial growth in the coming years, could hope to tap the wind for generating an estimated 5000 megawatts of power, equal to its current output from its various thermal power stations. According to Dr. K.S. Rao, director of Gujarat Energy Development Agency (GEDA), the wind farm project had definitely opened up new vistas of power development in the state. Promoted jointly by

e (GEDA) and the Gujarat Government, the Rs. 5-crore project is located on a stretch of 200 hectares f barren land in this sleepy coastal village. The farm ouses 50 wind turbines capable of generating 200 kilo-atts each.

The Danish International Development Agency DANIDA) has provided a grant of Rs 20 crore. Erecon work on the turbine was jointly carried by Vestas, Danish firm and RRB, an Indian firm. The 50 turbine ets comprise a tower of 35 metres and three large-zed blades each. Another feature of the project is that e entire operation of turbine sets is automatic and fully omputerised. The turbine gets down to work when the wind speed is 14.4 km per hour and starts 'breaking' the wind to generate power when its speed reaches 72.2 kmph. If the wind attained a speed of 90 kmph, the safety regulators in the system are set in motion and the operation is halted.

The wind farm has already been fed into the Gujarat Electricity Board's (GEB) grid system at Bhatia 22 kilometres from here more than 1.71 crore units of power. The cost of a unit of power has worked to 35 paise and 40 paise. The GEDA supplies the power to the GEB at Rs. 1.25 paise per unit compared to Rs. 2.17 per unit charged by the GEB.

— T.P.S. RAJAN.

CHEMARENA

S.L. VENKITESWARAN

Synthesis gas for methanol

Methanol has again become a growth item after a few years of overcapacity and this is largely due to the MTBE consumption. The world consumption of methanol and forecasts till 1995 is given in Table 1. It will be seen that use for MTBE has gone up from 2.42 million tonnes in 1990 to 3.57 million tonnes in 1992 and expected to rise to 6 million tonnes, second only to formaldehyde. The much talked about acetic acid uses only 1.5 million tonnes now and may go up to 1.87 million tonnes.

There is a major improvement in the process for syngas production from the feedstock — natural gas —through the combined reforming technology of Lurgi which saves energy. The Lurgi's low pressure methanol synthesis has been dominant and improvements in synthesis catalyst and distillation have been incorporated but it is only now that the area of major use of energy is tackled. Claims are for the use of 29.0 GJ per tonne on the new systems.

The conventional reforming using natural gas has a tubular reactor and heat is supplied outside the tubes by combustion of part of the gas. The combination of conventional reforming plus auto-thermal reforming enables reduction and also a better adjustment to the optimum $CO + CO_2$ mix. The basic flow scheme for the new system is given in Figure 1. In catalytic auto-thermal reforming the heat is generated by a combustion of part of the process gas inside the reactor which is internally lined to withstand higher pressure and temperature.

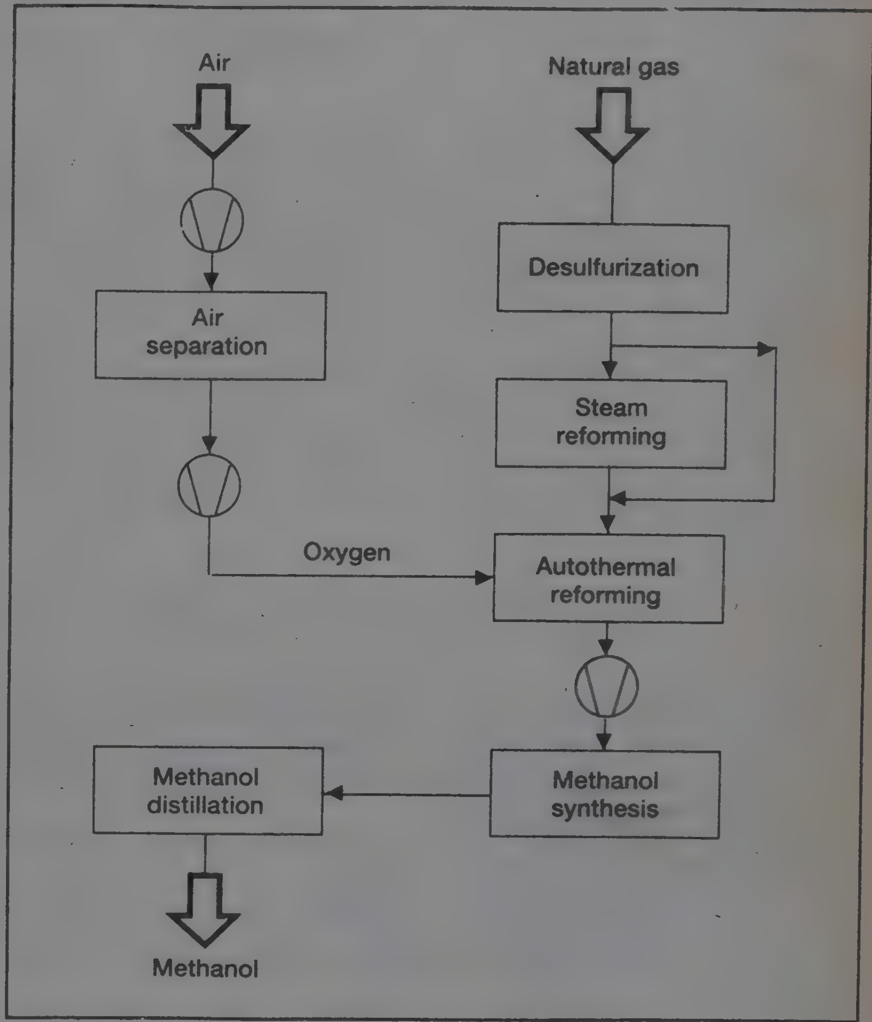


Fig. 1

Table - 1

WORLD CONSUMPTION OF METHANOL AND FORECASTED DEMAND (10^6 tpy)

	1990	1991	1992	1993	1994	1995
Consumption	18.35	19.50	20.50	21.50	22.65	23.90
Formaldehyde	7.03	7.27	7.49	7.73	7.85	7.98
MTBE	2.42	2.95	3.57	4.05	4.70	5.50
Acetic acid	1.36	1.51	1.55	1.63	1.72	1.87
Solvents	1.34	1.38	1.41	1.45	1.50	1.55
DMT	0.65	0.66	0.67	0.67	0.68	0.68
Methyl methacrylate	0.49	0.54	0.57	0.59	0.61	0.63
Gasoline	0.26	0.27	0.20	0.23	0.24	0.24
Others	4.80	4.92	5.04	5.15	5.35	5.45
Nameplate capacity	22.50	23.19	24.00	24.77	25.50	26.00
% utilization	82	84	86	87	89	92

Note: It is interesting to note from the last line of the table that the consumption in the next years will approach too closely the nameplate capacity of existing plants. Unless new capacity is added, the methanol market will suffer price tension.

Table - 2
TYPICAL DATA FOR CONVENTIONAL AND COMBINED REFORMING

	Steam reforming	Combined reforming
Process natural gas to steam reformer (%)	100	50
Outlet pressure steam reformer (bar)	19	37
Outlet pressure autothermic reactor (bar)	--	35
Outlet temp. steam reformer (°C)	875	780
Outlet temp. autothermic reactor (°C)	--	950
HC converted in steam reformer	83%	22%
Stoichiometric number SN = $(H_2 - CO_2) / (CO + CO_2)$	2.7-3.0	2.05
Energy req. syngas compr. (kWh/t)	260	130
Instrument air from:	Separate unit	Byproduct
Plant air from:	Separate unit	Byproduct
Nitrogen from:	Separate unit	Byproduct

There is less recycle gas with saving in compression costs.

The typical energy and efficiency figures for combined reforming and steam reforming is give in Table 2 and this is also a much better way than the catalytic autothermal cracking in use. The reactor size is lower and recycle is lower so that overall capital investment is a[n] estimated 10% less.

The new flurry of methanol units in the next few yea[rs] will find the new Lurgi system attractive.

(Ref: *Hydrocarbon Processing,* March 199[2])

Vital intermediates must be indigenous

India is obliged to import several intermediates for the pharmaceutical industry whereas the position in regard to pesticides and dyestuffs is better. Large quantities of N-acetyl sulphanilyl chloride are imported for sulpha drugs. D-alpha phenyl glycine for penicillins is another item. DL-amino butanol for ethambutol is imported. Isobutyl benzene, L-base, trimethoxybenzaldehyde are a few of the other major intermediates. Even simple chemicals like acetyl chloride and chloroacetyl chloride are large volume imports. It is not clear how far the control and regulations regime have been in the way and if the new liberal policy will help in import substitution or come in the way of programmes for indigenous production. A well thought out customs tariff has to promote import substitution. Presently a very large number of intermediates for drugs are allowed import on low or nominal customs levies and even where indigenous production catches up the long delay in revision of customs duties to the level as for chemicals leads to frustration.

While a positive programme for production of high value intermediates is very urgently needed there have been some recent developments. Herdillia Chemicals have started production of isobutyl benzene (on their own R&D) and could meet half of the requirements for the drug, ibuprofen. Indian Organic Chemicals claim to have started trimethoxy benzaldehyde required fo[r] making trimethoprim. Nascent Chemical Industries hav[e] started production of 2-chloro propionyl chloride als[o] required for ibuprofen as per an improved and simple[r] process. Many phenyl glycine plants has been approve[d] but none has reached a stage for commercial produc[-]tion. Indian Organic Chemicals has been making stron[g] efforts and recently Daurala Organics has also taken u[p] and got technical collaboration approval. Indian Institut[e] of Chemical Technology, Hyderabad has the newer car[-]bonylation process for the important malonic ester bu[t] apparently no concrete steps so far for commercial pro[-]duction. Some small parties claim to make diethyl mal[-]onate via cyanoacetic ester.

There is need for a detailed study on the high value intermediates now mostly imported, the process alter[-]natives, R&D programmes and efforts towards self[-]sufficiency. In this context there are a few high value secondary and tertiary derivatives from acetaldehyde and acetic acid on which India should concentrate —both for indigenous use and exports. Chloroacety[l] chloride was referred to earlier. Acetonitrile via ammon[-]ium acetate, dimethyl acetamide from acetic acid and dimethyl amine, the line of diketene derivatives, pyri[-]dine and picolines from acetaldheyde are some of these.

Cut on alcohol allocation removed

Chief Minister **Mr. Sudhakarrao Naik** has, according to a report in *The Financial Express*, reversed a controversial decision of the Sharad Pawar regime which had resulted in a massive imbalance in allocation of industrial alcohol in the State, it is reliably learnt. Industrial circles had been intrigued two years back, when SM Dyechem, a Bombay based company, was sanctioned an annual industrial alcohol quota of 1056 lakh litres for its proposed plant at Kurkumbh near Mr. Pawar's hometown of Baramati in Pune district for the manufacture of Mono Ethyl Glycol (MEG). This quota, sanctioned for the company, formed nearly two-thirds of the total quantum of 1700 lakh litres of alcohol earmarked by the State Government for industrial use for the entire State during the alcohol year 1991-92. When this lopsided allotment was brought to the Chief Minister's notice recently by some of the other industrial consumers, who feared an alcohol drought, Mr. Naik reviewed the earlier decision on June 7 and slashed the quantum assured to SM Dyechem to just 100 lakh litres.

Mr. Naik's decision to drastically reduce the allocation for SM Dyechem was endorsed by a Cabinet subcommittee at a marathon session at the Mantralaya chaired by State Excise Minister, **Mr. Shankarrao Kolhe,** and attended, among several ministers, by Industry Minister **Mr. Vilasrao Deshmukh.** The prevailing view at the committee is that the company could do with the reduced allocation for the current year as it has yet to commence production. The Cabinet sub-committee also decided to do away with a 10 per cent cut in the assured quota of supplies for various users enforced earlier by the previous regime. The committee also decided that all the existing major industrial alcohol users, including Indian Organic Chemicals Ltd. (IOC), Oswal Petrochemicals Ltd., Kolhapur Sugar Mills, Sommaiya Organics Ltd., and Polychem Ltd., besides the cooperative sugar units on the users' list, would be given their assured individual quotas of supplies during 1991-92. Over and above, these units would also be given 50 per cent of their additional requirements only in those cases where the expansion projects were ready for commissioning. Sources said the committee acknowledged the gravity of the situation arising out of excessive allotment earlier made to SM Dyechem, especially for newly setup units, which require alcohol very badly. Some of these units fear a law and order problem if they fail to commission their plants due to non-availability of alcohol. The committee therefore decided that new units, which are ready for production, would be allotted 50 per cent of their requirements to tide over the crisis.

The Cabinet sub-committee, apparently aware of the probable political fallout of its decision to slash SM Dyechem's assured allocation, made a conciliatory gesture to the company. The committee favoured a proposal to allow SM Dyechem to have a collaboration with four to five co-operative sugar factories of its choice to help them boost the distilleries' average production of 235 litres of alcohol per 1000 litres of molasses to 270 litres of alcohol per 1000 litres of molasses. The company would be allowed for exclusive use of the additional alcohol so generated through the use of modern techniques under the committee's new proposal.

Sources further said the committee was also aware, when it made this gesture, that SM Dyechem had invested about Rs. 300 crores in its Kurkumbh project only after the State Government had assureed it of an annual quota of 1056 lakh litres of alcohol in 1990 during Mr. Pawar's tenure. True, when SM Dyechem was sanctioned the massive quota, estimated alcohol production figure in the State during 1991-92 alcohol year was placed at a very encouraging 2800 lakh litres. Of this, 2500 lak litres was available for consumptio after allowing for medicinal use, expo etc. This was split up by the Govern ment in two: 1700 lakh litres for indus trial use and 800 lakh litres for potabl purpose. However, the move perturbe dozen other major users of industria alcohol in Maharashtra since the hug quota sanctioned for just one singl company meant they would be starve of their assured quota of supplies whil a number of other small-time user would be denied supplies. Among thes were several prominent co-operativ sugar factories. Observers feel alloca tion of industrial alcohol may becom a ticklish issue in 1992-93 alcohol yea since projections about sugarcane pro duction are not very encouraging. Alco hol production is, therefore, likely to fal from 2800 lakh litres in 1991-92 to 250 lakh litres the next alcohol yeas as pe these projections.

TDCMA FELICITATES PAST PRESIDENTS

The Tamilnadu Dyes & Chemical Merchants Association (TDCMA Madras, felicitated their past President **Dr. C.L. Metha** on the conferment o Hony. Doctorate of Philosophy in Edu cation from International University Los Altos, California (USA) and **Shr E.S. Reddy** on the conferment of Hony of Titles "Vijayashri Awards" a Madras from the Speaker of Tami Nadu Assembly, "Glory of India Gol Medal and Citation Internationa Award" at Washington, USA, from **Dr Abid Hussain,** Indian Ambassador to USA, "Pride of Asia Gold Medal" and Citation at Singapore, from **Shri J.N Tiwari,** Indian Ambassador to Malaysia at a function held on 27th May, 1992 at M.A. Chidambaram Conference Hal of South Indian Chamber of Commerce & Industry, Esplanade, Madras. Rtn Gov. **Shri. B. Viswanatha Reddy** (Dist. Gov. 3230), and **Sri Mohan Chandji Dadha** (Member, Minority Commission), were the Chief Guests.

New cement paint introduced

A micronised innovative cement-based paint, called Hitek Microsystem Coating, has been recently launched by Hitek Fine Chemicals (HFCL), a new company incorporated for this purpose.

HFCL managing director **Mr. Kishor Govani** claims that the new product is a unique blend of cement, polymers and additions. This, according to Mr. Govani, enables the user to cover more surface area in less time and cost when compared to other brands of paints available in the market.

Besides, against two coats of any other cement paint over a primer coat, Hitek Microsystem gives a perfect finish on a single coat. This against 2.5 kg to 3 kg of other premium cement paints to cover an equivalent area of identical surface, only one kg of the new cement paint will be required. According to Mr. Govani, other salient features of the new paint include a 70 per cent higher dry volume, hence more paint per kg of material; a brushability that is so smooth that a much larger area can be painted in a given time; the absence of lump formation during storage and good adhesive on smooth plaster without use of any liquid cement primer as required in other paints.

This results in a considerable saving on costs. Mr. Govani said that it would cost only Rs. 39 to cover 100 sq. feet as against Rs. 49 to Rs. 59 in the case of other conventional paints, plus the saving on labour costs of around Rs. 20 per 100 sq. feet due to higher output. The plant, set up at a cost of about Rs. 35 lakh to manufacture the new paint, has come up at Jigani Industrial Area near Bangalore. According to Mr. Govani, the plant has a capacity to manufacture 100 tonnes per month of paint. But the company encouraged by the preliminary test marketing surveys is aiming at a monthly turnover of 150 tonnes. Mr. Govani said that the capacity of the plant could easily be increased by adding the balancing equipment. The product would initially be introduced in Bombay, Bangalore, Hyderabad, Surat and Rajkot, Mr. Govani added. He estimated the total all India market for cement paints at around Rs. 200 crores per annum. The company was anticipating a turnover of Rs. 2.5 crores in 1992-93. Cement paints were first introduced in the Indian market by Snowcem 25 years ago. Snowcem today has the largest share of around Rs. 28 crores in the country.

Mr. Govani said that though Snowcem was the national leader owing to its all India marketing base, it was not the largest seller in any particular state because of the large number of local manufacturers of cement paints. In Bangalore itself, there are twenty five such manufacturers. The company was in the process of taking out a patent for the product in America, Mr. Govani added. According to Mr. Govani, cement paints had been phased out in America due to the emergence of new and better paints like acrylic and shenvlic paints which are technologically far superior.

KANOI GROUP SETTING UP Rs. 10.6 CR. UNIT

The Kanoi group of Industries, Madhya Pradesh, has embarked upon a major expansion-cum-diversification project at an investment of Rs. 10.6 crore. The project entails the setting up a Rs. 4.6 crore plant to produce liquid oxygen and nitrogen at Dewas, and a Rs. 6 crore exported oriented unit to manufacture life saving equipment, claimed to be the first of its kind in Asia.

The group, engaged in tea processing, has promoted a new company — Dewas Gases Ltd., — for implementing the project. The Managing Director of the company, **Mr. Sajiv Kanoi,** said the liquid oxygen and nitrogen unit will be a boon for steel plants in the region, which have to procure their requirement from plants located 400 kilometres away at present. He said the company will also be producing disposable monitoring electrodes, used for cardiac applications, for the export market. This plant is expected to go on stream by 1993. To generate resources for the project the company will be entering the capital market soon, Mr. Kanoi said.

15,000 TPA TITANIUM DIOXIDE PLANT MOOTED

The Hyderabad-based Pruthvi Industries Ltd. has not only obtained a licence but also State Pollution Control Board's clearance to set up a Rs. 150-crore titanium dioxide and sulphuric acid plant near the Orissa Sand Complex (OSCOM) in Orissa.

OSCOM, located 15 kms away from Berhampur in Ganjam district and conceived as the most ambitious plant among the decade-old Indian Rare Earths Ltd.'s group plants, has turned sick with piled up stocks of synthetic rutile, heavy and continuous losses and labour problems.

The Pruthvi Industries' unit near OSCOM is supposed to utilise the ileminite sulphur, caustic soda and hydrochloric acids from OSCOM and the nearby Jayshree Chemicals to reach a rated capacity of 60 thousand tons of sulphuric acid for captive consumption, and fifteen thousand tons of 'A' grade titanium dioxide, used in paints and pigment manufacturing.

MAX INDIA POSTS 3.85 LAKH NET PROFIT

Max India has reported a gross revenue including other income of Rs. 75.41 crore, up by 66 per cent over that of the previous year. Profit after depreciation was Rs. 6.44 crore, showing an increase of 59 per cent. Net profit stood at Rs. 3.85 lakh, up by 45 per cent. Export turnover has risen to Rs. 26.14 crore in 1991-92 from Rs. 8.81 crore in the last corresponding period, represneting a growth of 197%.

Penicillin import policy may be revised

The Centre is likely to revise import policy for penicillin G soon. The current 50:50 policy entitles penicillin G users to import 50 per cent of their requirement with the remaining 50 per cent to be necessarily lifted from the local market. This ratio is likely to be changed to 60:40, as was prevailing till September 1990.

This move comes in the wake of insufficient supply of the antibiotic by the two public sector units — Indian Drugs and Pharmaceuticals Limited and Hindustan Antibiotics Limited. These are the only two units in the country manufacturing penicillin G by fermentation. The revised policy will, therefore, enable the manufacturers of such derivatives as amoxycillin, cloxacillin, ampicillin etc. to meet their requirements through increased imports.

The decision, say industry sources, was taken at a meeting called by the Department of Chemicals and Petrochemicals on June 10, where representatives of IDPL and HAL were also present. The two companies expressed their inability to supply more, it is learnt.

The gravity of the situation can be judged from the fact that IDPL has been asking for 60 days advance payment from manufacturers. Similarly, HAL has not been able to fulfil commitments made as early as in March, payments for which have already been made, say sources at Bombay.

However, the short-supply situation is not unique to India alone. There does exist a shortage of penicillin G worldwide and prices in the international market bear testimony. Prices have shot up from US $17 to US $23 per bou in the last few months. This supply crunch is being attributed to two multinationals — Pfizer and Rhone Poulenc shutting down their penicillin G plants. Meanwhile, the Government has, in an obvious bid to prop up the two public sector units, hiked the prices of two penicillin G salts last month. This makes it the third upward revision in price in the last fifteen months. Moreover, to reduce complete dependance on these two units, the Centre has, in the past, given approvals to seven private sector units to manufacture this antibiotic.

VITAL PHARMA SETTING UP CAPSULE UNIT

Vital Pharma Impex is setting up a project to manufacture pharmaceutical grade capsules with an annual capacity of 76 crores. The capsules will be manufactured by fully automatic process of proven technology in a centrally airconditioned, dust and pollution free environment as per World Health Organisation (WHO) and GMP specifications.

The plant for the same will be set up at MIDC, Tarapur, and the land has been acquired. The project cost is estimated at Rs. 4.17 crore. The 83 per cent of the project cost will be financed by equity capital amounting to Rs. 3.47 crore, of which promoters will be contributing Rs. 1.04 crore. The balance project cost will be financed by subsidy of Rs. 20 lakh and DPG of Rs. 50 lakh resulting in a very low debt-equity ratio.

The company plans to export at least 70 per cent of its production, which will earn valuable foreign exchange for the country and tax-free profits for the company. The company has already finalised export orders from Malaysia, Vietnam, Nigeria, Africa, Bangladesh, Zurich etc.

The company is planning to come out with a public issue around July and will be listing its share on all the major stock exchanges. It is also negotiating with top financial institutions to appoint them as the merchant bankers.

IDPL seeks Rs. 60 crore to fund revival

In a bid to bail out the resource-starved public sector Indian Drugs and Pharmaceuticals Ltd. (IDPL), the company's management has sought a fresh Rs. 60 crore short-term assistance from the Government. The company intends to utilise this to support the current operations and meet the working capital requirements.

As per the company's plans, Rs. 20 crore will be put in as working capital and Rs. 20 crore towards plan funds to support the on-going penicillin, vitamin B-1, B-2 and rifampicin projects. Another Rs. 20 crore would be used for accelerating the Voluntary Retirement Scheme, currently under way.

IDPL has also asked for a government guarnatee on cash credit to the company. The scheme has been discussed at a recent tripartite meeting held by the Ministry of Labour. Apart from the Minister of State for Labour, **Mr. P.A. Sangma,** the meeting was attended by representatives of the trade unions and those public sector companies which have already been referred to the Board for Industrial and Financial Reconstruction (BIFR).

It may be recalled that the company was formally referred to BIFR on May 25, after making a cumulative loss of Rs. 546.74 crore (provisional figure) in 1991-92. However, the Board is yet to start hearing on public sector companies.

The rehabilitation scheme, submitted by the management to the government, envisages support in the form of regularisation of the cash credit limit at Rs. 96 crore and assistance in operational requirements for 1992-93 from the bankers's side. By way of policy support from the government, IDPL management has asked for capital restructuring and functional authority in commercial decisions as per changing market situations.

Pricing of bulk drugs from basic stages, involving huge capital outlays, should be taken out of price control, the scheme suggests. It has also called for the continuance of purchase preference for pharmaceuticals for three more years. The company has also suggested the transfer of titles for land to it by the respective State Governments. IDPL has been facing acute financial crisis, particularly from April, 1992 due to erosion of working capital.

The external assistance and banking support to the company have come down from Rs. 49 crore in 1988-89 to Rs. 31 crore in 1989-90 and Rs. 8.6 crore in 1990-91. The company [cut off] been carrying out operations by stret[cut off] ing its resources, reducing inventor[cut off] and book debts, availing credits [cut off] postponing even statutory paymen[cut off] From April this year, production lev[cut off] have started declining aggravating [cut off] position.

According to IDPL officials, the go[cut off] ernment has not provided any non-pl[cut off] assistance for the operation of the co[cut off] pany though it was engaged in a co[cut off] health-care industry, producing essent[cut off] and life-saving drugs for the nation[cut off]

With the rehabilitation and restructu[cut off] ing of the company not having be[cut off] cleared by the government, remedi[cut off] measures, including borrowings, forei[cut off] credits, tie-ups and collaboration agre[cut off] ments have been rendered difficult [cut off] the historically accumulated loss[cut off] presented a poor picture and we[cut off] making day-to-day difficulties to th[cut off] management.

In December 1991, the Board o[cut off] Directors had submitted a rehabilitatio[cut off] plan envisaging the write-off of liabil[cut off] ties, government loans, penal interes[cut off] and compound interest to the tune of Rs[cut off] 322 crore. It had also envisaged an addi[cut off] tional cash investment of Rs. 49 cror[cut off] for the modernisation and debottleneck[cut off] ing schemes to utilise existing infra[cut off] structure.

Overcharging in drug prices alleged

Several vital drugs will continue to be out of reach of the common man with drug formulators proposing to cut down on production to mitigate the loss incurred through purchase of bulk drugs at unremunerative prices. This development is the offshoot of bulk drug formulators selling their product at a premium ostensibly to make up for their losses due to the "unrealistic" notified prices fixed by the Government.

The Department of Chemicals and Petrochemicals is in a fix trying to resolve the problem. It is actively considering further revision of bulk drug prices as it is being flooded with complaints from drug formulators that several notified bulk drugs are being sold to them at a high premium. In some cases the difference between the market price and the notified price of the bulk drug is as much as 50 per cent.

In order to curtail such a practice, the government has warned at least 200 companies and sought details about their transactions with various formulators. The violating bulk drug manufacturers have been asked to furnish the rates and the quantum of product they have sold during the last quarter. So also their output during the period.

Drug industry sources revealed that over a dozen bulk drugs are currently being sold in the market at prices way above their respective notified price. For example, the market price of erythromycin estolate is Rs. 4,250 per kg as against the notified price of Rs. 2,760. Similarly erythromycin stearate is sold for Rs. 3,800 per kg as against the notified price of Rs. 2,642. As per data available chloramphenicol powder is sold for Rs. 2,200 per kg instead of Rs. 1,300 while rifampicin is available for Rs. 5,750 per kg as against the notified price of Rs. 4,946.

These are mere examples of some of the wide disparities existing between the notified price of bulk drugs and the actual market rate. In some cases like Vitamin-C and Trimethoprim the difference between the sale price and notified price is comparatively lower but nonetheless it exists.

Hence, the formulators argue that they are being forced to buy these bulk drugs at unremunerative prices in order to meet their production commitment. Further, selling the formulation at a notified price has meant severe losses, they contend. The current shortage of several vital drugs is directly linked to this, as many leading drug companies have decided to cut their losses by reducing their output.

In the case of Vitamin-C, representatives of both Jayant Vitamins and Sarabhai Chemicals — the two manufacturers of this bulk drug, had strongly refuted the allegation that they were supplying the product at enhanced rates.

The fact that overcharging is not a new practice is evident from a letter addressed by a senior official of the Department of Chemicals and Petrochemicals to the Pharmaceutical & Allied Manufacturers & Distributors Association Ltd. (PAMDAL) on September 23, 1992. The letter states that it has been brought to notice that "certain manufacturers of bulk drugs have been charging over and above the notified prices of bulk drugs on one or the other pretext. The ground on which extra/overcharging is being done are in the name of special processing charges, material offered of special quality, compaction charges, cost of packing, forwarding, handling, transit insurance, freight, etc".

Requesting that the association bring the matter to the notice of all members, the official letter had stated that under the provision of the Drug Prices Control Order (DPCO), 1987, a manufacturer cannot charge anything beyond the actual towards packing charges, freight, handling charges, transit insurance, e The association was made aware that the event of any contravention of t provision of Drug Prices Control Ord 1987, the manufacturer was liable to punished under section 7 of the Esse tial Commodities Act, 1955, read wi paragraph 26 of DPCO, 1987.

As per the provisions of DPCO, a official authorised by the Centre or t State Government can enter the prem ses of the violating manufacturer conduct the search and make a seizu Unfortunately, while condemning t malpractice by some bulk drug man facturers, the Government officia agree that some of them have a gen ine grievance as the notified price despite the periodic revision, is unr munerative. In fact, the price fixed b the Ministry in many cases is muc below the notified price suggested b Bureau of Industrial Costs and Pric (BICP).

VYSALI PHARMA ENTERING MARKET

Vysali Pharmaceuticals, manufactu ing a wide range of pharmaceutical fo mulations, is setting up a bulk drug pla for the manufacture of semi-syntheti penicillin, antibiotics and antibacteria in a phased manner.

Based on the past performance of th unit, the company hopes to earn a rea sonable profit working at 10 per cen 30 per cent and 45 per cent of installe capacity in the first, second and thi year of operation.

The gestation period is low as th project implementation of the first phas will be completed by September, 1993 There is a vast potential in the domes tic and export market for the complet range of injectible penicillins with th export of drugs and pharmaceutica during 1991-92 registering a growth o 49 per cent in rupee terms. Enquiri have been already received from Nigeria, Ghana, Zaire and Abu Dhabi

DBT okays ten biotech units in 1991-92

Altogether 10 industrial approvals were accorded for setting up production units for plant tissue culture and other agricultural products both for the domestic market as well as for 100 per cent export, according to the annual report of the Department of Biotechnology (DBT) for 1991-92.

At present, the capacity distributed among 15 units approved so far was for the production of about 100 million plantlets per annum, the report said. The total investment contemplated in these units would be about Rs. 55 crore and once operational, the units have the potential of earning about Rs. 45 crore in hard currency annually.

The programmes of production in these companies included micropropagation of foliage plants, flowering plants, tropical temperate fruit, plants and plantation crops, it said. The current production of tissue-cultured plants for domestic consumption was about two million while six million were being exported, the report said. The report said that two companies were specialising in the promotion of plant growth regulators, one of which had set up manufacturing facilities in India and was using its own technology, while the other was marketing an imported formulation. It said that the products were receiving increasing attention by the farmers of foliage crops and the sale value of these range of product was estimated to be about Rs. 6 crore.

Referring to the development of vaccines, immunodiagnostics and immunobiologicals, the report said that six industrial undertakings took permission for marketing and production of these vaccines. A company, it said, had started producing several vaccines and the significant developments included 100% indigenisation of measles vaccine production. The report said that in the area of immunodiagnostics, creation of production facilities for the manufacturing of AIDS diagnostic kits by one company had made substantial progress. An other unit had obtained indigenously-developed technology packages for the production of diagnostic kits for detection of amoebic liver abscess and for blood grouping which would be introduced in the market soon.

HIND CIBA-GEIGY TO PAY 24%

Hindustan Ciba-Geigy has recorded a rise of over 22% in its turnover to Rs. 338.62 crores for the year ended March 1992 from Rs. 277.20 crores in the previous year. The directors of the company have proposed to pay a final dividend of 13% on an expanded capital, totalling a dividend of 24% for the year as compared to a dividend of 26% on pre-bonus capital in the previous year. The proposed dividend will absorb a sum of Rs. 6.38 crores (Rs. 5.84 crores).

Centchroman to be made available country-wide by year-end

The once-a-week contraceptive pill 'Centchroman', developed at the Central Drug Research Institute (CDRI) at Lucknow, will become available in most parts of India by the end of the year, according to CDRI Director, **Dr. B.N. Dhawan.**

"The product has generated unprecedented enthusiasm in Indian and foreign drug industry", he said. Centchroman, sold under the brand name 'Saheli' was first marketed in Delhi last year, and a few months ago in Calcutta. Very soon it will be available in Madras.

Centchroman was introduced in the family welfare programme last year and the demand for the pill outstripped supplies. Dr. Dhawan said the pill was not being produced in adequate quantity by the public sector Hindustan Latex Ltd. He said the CDRI has recently signed an agreement with Torrent Laboratories of Bombay "which is going to take up the production in a big way". It is also produced by a private firm in Madras.

Dr. Dhawan said the CDRI has also signed agreements with six firms from France, Spain, Cuba, South Korea, Turkey and Bangladesh. Centchroman is the first Indian-made birth control product to be sold abroad. According to Dr. Dhawan, the pill may soon be produced in Bangladesh. South Korea wants to buy the drug in bulk, while the Hindustan Latex is trying to set up a unit in Australia to produce the pill there.

KANOSIKA LAB PLANS EXPANSION INTO BULK DRUGS

Kanosika Laboratories Ltd., set up with the objective of producing seaweed-based natural polymers, has chalked up expansion plans to enter the basic drugs and pharmaceutical market with a 50 per cent export-oriented plant.

The plant, located at Patancheru and the final stage of construction, will manufacture basic such as cefazolin, cefadroxyl, cephadrine and cefaclor. These are penicillin alternatives and will be produced in vials and IV injectibles.

The cost of the expanded project is estimated at Rs. 19.60 crore. These drugs are import substitutes. The in-house R&D unit is being set up at Uppal at an estimated cost of Rs. 1 crore. The company is being promoted by **Mr. Harshavardhan Sikaria,** and has plans to make seaweed-based natural polymers and alginic acid. According to release issued recently in Calcutta, th drugs are import substitute, and have good domestic and international marke

ASIAN PAINTS TO SET UP JOIN VENTURE ABROAD

The Directors of Asian Paints (India have, besides stepping up dividend t 50% from 45%, proposed to issue bonu shares in the ratio of three for five share held. The company has reported impres sive working results for the year ende March 1992 with all-round growth i production, sales and profits.

The company also proposes to set u a joint venture unit for the manufactur of paints and enamels on the Pacifi Island of Vanuatu at an estimated cos of $6.90 lakh. The total cost of the project is proposed to be financed by a equity capital of $2.70 lakh and loans of $4.20 lakh.

The company and its three overseas subsidiaries would subscribe to more than 50 per cent of the equity share capital. For the year ended March 1992, sales of the company have registered a growth of about 28 per cent at Rs. 470 crores against Rs. 367 crores in the previous year. The gross profit has jumped to Rs. 4,259 crores from Rs. 29.23 crores.

A rapid wrap-up of what's new in Operations, Processes and Products

The pull and push on Chemistry

G. Whitesides has given a fascinating account of this subject. The pull is provided by national security, health care, the environment and energy. The push is provided by materials chemistry, biological chemistry, computation chemistry and small basic sciences. Chemistry has moved from the study of atoms and small molecules to the study of large molecules and collection of molecules. Polymer blends and alloys and fiber-reinforced polymers provide challenging areas. The use of nanostructured materials is gaining importance. The development of structure-property relationships for interfaces will be a rewarding area. The development of functional and "smart" materials will be yet another area of interest.

Environmentally more compatible materials and processes will attract attention.

The problems posed by biology and by behaviour of condensed phases will unquestionably offer a varied range of opportunities.

Catalysis will contine to occupy an 'important position'. (*Chemtech.*, 1992, March p. 144).

Modified precipitated $CaCO_3$

ECC Int., USA has claimed that the addition of a polyhydric alcohol, a polyphenol, a polybasic acid, etc. during carbonation of lime slurry to $CaCO_3$ results in precipited $CaCO_3$ with better light scattering properties. (E.P. 468,719, Jan. 1992; *Chem. Abstr.*, 1992, **116**, 154893).

Transport bed reactor (TBR) for n-butane to maleic anhydride (MAN)

DuPont has developed a new TBR for air oxidation of n-butane to MAN which gives a safe operation and allows higher yields of tetrahydrofuran (THF) without isolation and storage of MAN. THF is used for making polyether glycols; it is also used as a solvent and for making a natural-gas odorant tetrahydrothiophene. (*Chem. Eng. News*, 1992, 9 March, p.6).

An improved reaction system to investigate micromixing in high-intensity mixers

Bourne, who has done pioneering work in micromixing, has now come out with an improved test system for studying the role of micromixing. The simultaneous coupling of 1- and 2-naphthols with sulfanilic acid is recommended and this allows energy dissipation upto 105 w/kg. to be covered. Kinetic data are provided. (*Ind. Eng. Chem. Res.*, 1992, **31**, 949).

Catalysts for changing industry

There is a lead article on this subject in a recent issue of *Chem. Engg. News* (1992, 9 March, p. 27-49). The present world market is in the ambit of 6 billion Dollars per annum. It will be imperative to develop new safe processes to be operated. The impending chenges in the content of C_4 and C_5 fractions and benzene in gasoline in USA and Europe will lead to important changes in the availability of these feedstocks and also for a change in reforming catalysts and catalysts for dehydrogenation of isobutane to isobutylene for making MTBE. Isomerization of n-butane to isobutane will therefore get a boost. The growth in MTBE is spectacular. Further lowering of aromatics and sulphur content in diesel will give a boost to hydroprocessing.

The largest segment of catalysts FCC continues to attract attention. Attempts are being made to increase the yield of olefins in the LPG fraction. The growth of new catalysts which can be used in existing equipment looks very promising.

There is a demand to change HF as a catalyst in alkylation reactions (e.g. for making linear alkylbenzene) by solid catalysts.

Catalysts for polymerization of ethylene/propylene continue to witness improtant developments. A specific reference should be made to the exciting development of single-site metallocene catalysts which produce highly regular polyolefins with narrow molecular wt. ranges.

Catalysts for syn. gas for methanol and ammonia (and shift conversion catalysts in ammonia plants) continue to see developments.

Partial hydrogenation catalysts for edible oils and fats are attracting attention in view of the taboo against the saturated fats.

The market poised for the largest growth is emissions control—both for mobile and stationary sources. Englehard calls its combustion technology "Catathermal Combustion" which operates below 1500°C and thus lowers NO_x emissions from power stations.

Propylene oxide (PO)

There is a lead article on this subject in a recent issue

of *Chem. Engg. News* (1992, 2 March, p. 9-12). The ARCO process for co-production of PO with tert-butanol (or isobutylene) or styrene, has brought out a sea-change and further improvements in this novel process have been made. Dow is considering modifying the chlorohydrin process to use lime in place of NaOH. New uses of propylene glycol are being considered, such as in antifreeze where it is a safer material.

Oxidative dimerization of 2,6 xylenol

Mitsubishi Pet. Co. as claimed that highly pure 3,3', 5,5'-tetramethyl-4,4' biphenol is obtained by oxidation in liquid phenol with water-alcohol mixtures, in the presence of Na-lauryl sulfate and cupric acetate. (*Chem. Abstr.*, 1992, **116**, 105840).

Primary branched alcohols from paraffins and HCHO

Texaco Chem. Co. has claimed that n-alkanes can be condensed with HCHO, in the presence of a radical initiator like ditertbutylperoxide, to give the 2-hydroxymethyl alkane (e.g. dodecane). (U.S.P. 5,072,060, December 19; *Chem. Abstr.*, 1992, **116**, 105618).

Dimethyl carbonate (DMC) to methyl carbamate

Ube Ind. has claimed that the title reaction can be carried out with liquid NH_3 and DMC in the presence of methanol and a small amount of water. (E.P. 449,558, October, 1991; *Chem. Abstr.*, 1992, **116**, 108645).

Benzoic acid/Benzyl benzoate to benzaldehyde

Mitsubishi Kasei K.K. (Japan) has reported that catalysts based on ZrO with Pb/In/Cr/Mn allow vapour phase hydrogenation of benzoic acid to benzaldehyde. (Yokoyama, T. and Fujii, K., *Petrotech*, 1991, **14** (7), 633-637; cf *Chem. Abstr.*, 1992, **116**, 105700).

The above company has claimed that benzyl benzoate on hydrogenation, in the presence of ZrO_2 based catalysts, gives benzaldehyde and benzyl alcohol. (*Chem. Abstr.*, 1992, **116**, 105846).

Propyne (methylacetylene) to methyl methacrylate (MMA)

Shell has claimed that the C_3 fraction from naphtha crackers/LPG dehydrogenation units can be purified w.r.t. propyne/allene with simultaneous recovery. MMA can be made from propyne, after separating allene which can be separately isomerized to propyne, by carboxylation in the presence of a Pd-based catalyst. (U.S. 5,081,286, Jan. 1992; *Chem. Abstr.*, 1992, **116**, 129859; also E.P. 441,447, August, 1991; *ibid*, 129842).

Cat-crackers: New catalyst which boosts isobutylene yield

Englehard has developed a new family of cat-cracking catalysts (ISOPLUS) which dramatically increase yields of isobutylene from existing refinery equipment. It appears that Isoplus 1000/2000 increase the yield of isobutylene by 70% to 120% and also yield of other isolefins and olefins and reduce aromaticity upto 20%. (Thus isobutylene yield goes up from 2.1% by volume to 3.7% with Isoplus 1000 and 4.6% with Isoplus 2000). (*Chem. Eng. News*, 1992, 20 April, p. 5).

Oxidation of paraffin to alcohols/ketones with H_2O_2: titanosilicate catalysts

Tosch Corpn., Japan, has shown that 30% H_2O_2 can be used to oxidise, say, n-hexane at 50°C; 2-hexanol and 2-hexanone along with 3-hexanol/one were formed. (*Chem. Abstr.*, 1992, **116**, 58753).

Kinetically controlled separation of Ni(II) and C(II) using micelle solubilized extractant in membrane processes

Ismael and Tondre have used (7-14 ethyl-1-methyloctyl 1-8-hydroxyquinoline) solubilized in CTAB cationic micelles for selective separation of Ni and Co. The use of dialysis and ultrafiltrations membrane is discussed and total removal of Co(II) is possible. (*Langmuir*, 1992, **8**, 1039).

Reaction of cyclohexene

Cyclohexyl acetate (CA)

Mitsui Toatsu Chem. has claimed that heteropolyacids (e.g. dodecyl tungstophosphoric acid) catalyse the reaction of cyclohexene with acetic acid to give CA. ZSM-5 does not work. (E.P. 461,580, December 1991; *Chem. Abstr.*, 1992, **116**, 58833).

Alkylation of hydroquinone (HQ)

Asahi Chem. Ind. has claimed that H-Y zeolite catalyses this alkylation in MIBK medium at 90°C; 30% C-alkylated product and 19% p-hydrophenyl cyclohexyl ether. (*Chem. Abstr.*, 1992, **116**, 58946).

Selective bromination of alkenes with bromine in the presence of zeolites

Smith and Fry have shown that pentasil zeolite allows

selective bromination of branched vs linear or vice-versa, by manipulation of the order of addition of reactants. (*J. Chem. Soc., Chem. Commun.*, 1992, p. 187).

A new route for alpha olefins

Henkel Res. Corpn. has claimed that a fatty acid, such as myristic acid, can be reacted with acetic anhydride in the presence of $Cl_2(PPh_3)_2Pd$ and PPh_3, at 100-300°C, to give 96.3% 1-tridecene. (U.S.P. 5,077,447, December 1991; *Chem. Abstr.*, 1992, **116**, 151131).

Chemical Collectivism: Micelles

Menger, who has made very valuable contributions in the area of micellar catalysis, in a recent A.C.S. San Francisco meeting, has brought out succinctly the special aspects of molecules working together. Thus, imagine a cancer cell moving through the blood stream exuding a particular enzyme and this cell collides with a shell carrying an anti-cancer drug. Here high target specificity can be realised. Micelles can speed up reactions enormously and even mustard gas can be destroyed effectively with micellar and microemulsion system. (*Chem. Eng. News*, 1992, 20 April, p. 26).

MTBE/ETBE

[There is an intense activity in this area and in this column this subject has been covered regularly]. Francoisse and Thyrion have studied the kinetics aand mechanism of ETBE with Amberlyst 15 cationic ion exchange resin catalyst. The range of temp. was 50 to 90°C and pressure 2 MPa. The affinity of resin for polar substances and the strong non-ideality of the liquid phase lead to a complex kinetic expression. Simultations performed with the model agree satisfactorily with the experimental results. (*Chem. Eng. Process*, 1991, **30**, 141-149).

There is an intense activity in modifying catalyst for cat-cracking of heavier petroleum fractions to maximise olefins yield and to reduce aromatics content. A substantial improvement in the yield of isobutylene, butenes and propylene has been realised. Chang and Lebby have discussed the effects of adding an MTBE unit to an existing FCC/Alkylation modified catalysts. (*Hydrocarbon Process*, 1992, February, p. 41).

A 40000 bpd cat-cracker, with the new catalysts, can give MTBE at 2100 bpd. The C_4 raffinate from MTBE can be oligomerised to give more linear or more branched C_8 olefins. (Nierlich, F, *ibid*, p. 45) Thermal steam cracking of isobutane can give a high yield of isobutylene + propylene. (Monfils et.al. *ibid*, p. 47).

Luide has now reported the use of chromia on alumina catalyst for dehydrogenation of propane to propylene or isobutane to isobutylene. Catalyst selectivity of 91 mole% for propylene and 95 mole% for isobutylene has been realised. The reaction occurs at 580 to 550°C at 2 atm. (*Chem. Eng.*, 1992, **99**, No. 4, April p. 19).

MTBE: Poisoning of ion exchange resin (IER) catalyst

The C_4 fraction from naphtha crackers is first subjected to butadiene recovery via extractive distillation with a solvent like acetonitrile (AN). The carry over, at ppm level, of AN can affect cationic IER catalyst as it hydrolyses to acetic acid and ammonia and the latter neutralises acidity on IER. (*Hydrocarban Process*, 1992, **71**, No. 1, p. 21]

H_2 to S: Process improved

Hardison and Ramshaw have discussed the use of chelated iron catalyst for the removal of H_2S from lean gases and conversion to sulfur. Large volumes of catalyst solution can be recycled. In the LO-CAT II module air rates and pressures are lower, resulting in greatly reduced air compressor costs. (*Hydrocarban Processing*, 1992, **11**, No. 1, p. 89).

Supported aqueous phase (SAP) catalysts

Thin films that reside on high surface area hydrophilic supports can be effectively used as catalysts, with a number of advantages, for liquid phase reactions. The solid-supported liquid phase catalysts (SLPC) are different and are used for gas phase reactions. The hydroformylation of oleyl alcohol at 100°C and about 50 atm was successfully tried with controlled-pore glass impregnated with HRh (CO) $[P(m\text{-}C_6H_4SO_3Na)_3]_3$ and $P(m\text{-}C_6H_4SO_3Na)_3]_3$ (triphenylphosphine trisulfonate). (*Chem. Eng. News*, 1992, 27 April, p. 40).

Oxidation of paraffins with O_2: Ti-silicate supported Pd

Erinicerche (Snam-Progetti) has claimed that the catalyst under reference, for instance, oxidises n-hexane, in the presence of H, to give 2-and 3-hexanone. (EP 469,662, February 1992; *Chem. Abstr.*, 1992, **116**, 151154).

Removal of formaldehyde from aqueous solutions

Aqueous solutions containing formaldehyde were treated with urea and dimedone to bring down 1000 ppm to less than 200 ppm. (*Chem. Abstr.*, 1992, **116**, 86252).

Highly selective syntheses of light olefins from methanol

Inui has shown that with controlled acidity of zeolites and incorporation of some metals selectivity can be changed. It is remarkable that with Ni containing SAPO-34 ethylene was obtained with 90% selectivity at 100% MeOH conversion. (*Sekiyu Gakkaishi*, 1992, **35**(1), 33-40; cf *Chem. Abstr.*, 1992, **116**, 152453]

Recovery/recycle of polyurethanes (PU)

ICI has claimed that PU can be subjected to glycolysis with glycol at 200°C which requires moderate pressure. Polyether polyols so produced can be recycled. (*ECN*, 1992, 27 April, p. 24).

Ether synthesis from activated aromatic halides and alkali-metal carbonates

Fukawa et al have shown that aromatic halides, activated by an electron withdrawing group at the *o* or *p* position, react with alkali metal carbonates/bicarbonates at elevated temperature to form ethers. The ether yield is markedly enhanced by catalysts such as silica and aluminium silicate. Cuprous and cupric compounds act as co-catalysts. The reaction of p-chloro benzophenone with K_2CO_3/Na_2CO_3 was investigated in detail. (*J. Chem. Soc. Perkin Trans.*, 2, 1992, p. 377-382).

Addition of halo compounds to alkenes with homogeneous catalyst: Enhancement through microwaves

Adamex and Hajek have shown that the addition of carbon tetrachloride and ethyl trichloroacetate to styrene, in the presence of copper (II) amine complex, is intensified by a factor of 3 to 21 with microwaves. (*Tetra. Lett.*, 1992, **33**, No. 15, 2039).

Carboxylic acid esters

Clay minerals containing Zr compounds act as a good catalyst for the reaction between acetic acid and butanol (or even olefins) to give the corresponding esters at 50°C. The reaction rate is more than 60% of that realised with Nafion H. (*Chem. Abstr.*, 1992, **116**, 151332).

Polycarbonates based on new bisphenols

Bayer has claimed that polycarbonates of better qualities w.r.t. glass transition temp., impact strength, etc. are obtained with new bisphenols, such as, dihydroxydiphenylcyclohexanes.Thus, 3,3,5 trimethyl cyclohexanone (dihydroisophorone) based bisphenol gives excellent polycarbonates. Dodecylthiol was used as an activator with HCl gas catalyst for making bisphenol. (E.P. 414,083, February 1991; *Chem. Abstr.*, 1991, **115**, 50545).

4-Hydroxy-2-cyclopentenones with high optical activity via isomerization of the corresponding epoxide

3,4-Epoxycyclopentanone can be isomerised in the presence of Al tri-isopropoxide and optically active, 2,2'-dihydroxy-1,1-binaphthyl (1,1'-bi-2-naphthol) and p-nitrophenol at 19°C, to give 93% (R)-4 hydroxy-2-cyclopentenone in 91% e.e. (Teijin Jap. Pat.; *Chem. Abstr.*, 1992, **116**, 151216).

New hydration process for n-butene: Supercritical conditions

Yamado and Muto (of Idemitsu Petrochemical Co., Japan) have described a new process for sec butanol (SBA) from n-butenes. Here operating conditions are deliberately manipulated to be supercritical w.r.t. butenes; aqueous solutions of heteropolyacids are employed. An anomalous behaviour of gas liquid equilibrium was exploited for extraction of SBA. (*Sekiyo Gakkaismi*, 1991, **34**, No. 3, 201).

Cyclohexene from benzene

Scholten and co-workers have earlier reported selective hydrogenation of benzene(B) to cyclohexene (CH). They have now reported a detailed study of this fascinating hydrogenation in liquid phase where the role of gas-liquid and liquid-solid mass transfer has been delineated. Ru based catalysts in the presence of an aqueous solution of $ZnSO_4$, were employed at 150°C and a pressure of 5.0MPa. The ratio of benzene to water was also studied. It is very important that the catalyst is hydrophillic and therefore surrounded by a stagnant water layer. Selectivity w.r.t. CH of 40 to 50% has been realised. Catalyst particles have to be fine and an average size of 50 microns has been reported. Cyclohexene gets into the benzene phase and this allows the desired selectivity. (*Applied Catalysis*, 1992, **83**, 263-295).

In a related paper Struizk and Scholten have studied the role of reaction modifiers for selective hydrogenation of benzene/toluene over Ru catalyst. Substances contaming hydroxyl and amino group have been found to be useful. (*Applied Catalysis*, 1992, **82**, 277-287).

Solubility of cyclohexene in water and water-sulfolane mixtures has been measured by Anneman and Beenakers, with a view to have a retional basis for direct hydration of cyclohexene to cyclohexanol using cationic ion-exchange resin as a catalyst. (*Ind. Eng. Chem. Res.*, 1992, **31**, 1227-1231).

Goldstar group entering bulk drugs field

Goldstar Remedies Limited is being promoted by the Rs. 300 crore Goldstar group which has established its credentials in the core areas of steel, cement and leasing. In keeping with its policy of growth through diverisification, the group has now entered the health care industry with this new venture.

Goldstar Remedies Limited was set up in 1991 as an overseas trading house for bulk drugs. Having established their operations by winning export orders, the company is now expanding into the manufacture of bulk drugs and pharmaceuticals at their modern plant located in the notified backward area of Medak District, Andhra Pradesh, off the Hyderabad-Bombay highway.

The project is promoted by a dynamic and experienced group of financial and technical entrepreneurs qualified in various disciplines, and managed by a team of professionals having considerable experience in all aspects of the bulk drug and pharmaceutical industry.

The Board is chaired by **Mr. N. Krishna Mohan,** main promoter of the Goldstar group of companies. A gold medallist of ICWA, he brings to the company over a quarter century of experience in the industry.

The market scenario for pharmaceutical products is extremely bright today. The worldwide sales of pharmaceuticals was worth $140,805 million in 1988 and is projected at $179,010 million in 1993-showing an annual growth of 15 to 45 per cent for the various categories of drugs.

The company plans to manufacture high-demand diclofenac sodium, trimethoprim and pharmaceutical formulations tablets, capsules and injectables. Diclofenac Sodium alone is one of the 10 highest selling drugs worldwide, with an annual sales of US $970 million in 1989.

On the domestic front, the demand for pharmaceuticals has boomed in recent years due to improvements in healthcare infrastructure and rise in health awareness at all levels. Therefore, the demand in India for pharmaceutical formulations is estimated to be worth Rs. 8,300 crores in 1994-95 and Rs. 16,000 crores in 1999-2000. Goldstar Remedies has proposed to initially enter the international market, and later expand into the domestic market. The company has already finalised marketing tie-ups with Overimpex (Holding) Ltd., U.K., and is receiving a continuous flow of enquiries from abroad for its products.

The production facilities of the project are expected to go on stream by the second half of 1992. The plant is being designed to conform to US FDA and UK DHSS, GMP regulations. The company has already established a full-fledged R&D Laboratory and pilot plant. The R&D, headed by an experienced Doctorate, is in full swing.

The cost of the project is estimated at Rs. 725 lakhs and is proposed to be financed by equity of Rs. 660 lakhs (promoters Rs. 265 lakhs and public Rs. 395 lakhs). Subsidy is Rs. 15 lakhs and term loans Rs. 50 lakhs.

The company expects to achieve an annual turnover of Rs. 1,256 lakhs in the first year of operation, which is estimated to reach Rs. 2,010 lakhs by the end of the third year. The profit after depreciation is estimated at about Rs. 100 lakhs in the very first year, which will shoot up to Rs. 205 lakhs by the end of the third year.

Keeping in view its proven track record, professional management and excellent potential the company is confident of achieving these financial targets without any difficulty.

DRUGS, CHEMICALS ETC.

15-year transition period before patents likely

India has conveyed its willingness to accept some of the clauses relating to patent protection in the Dunkel draft on trade related aspects of intellectual property rights (TRIPS) subject to the condition that a transition period of 15 years is allowed according to a report appearing in *The Business and Political Observer*.

The clauses, contained in article 31 of the TRIPS text, relate to the compulsory licensing of patents in the drugs, pharmaceuticals, food and chemical industries and their acceptance will involve changes in India's patent laws to provide multinationals with stronger patent protection.

Officials say that India's readiness to accept these provisions under article 31, which is titled "other use without authorisation of the right holder," was conveyed in Geneva earlier during the negotiations for the GATT talks.

India has said that until the 15-year transition period lapses, the country should be allowed a special dispensation for compulsory licensing in the case of these three industries. While even this will involve changes in patent laws, it will still not accord the patent holder much protection.

Officials defend the shift in India's stand on the ground that it does not really have much international support on this issue. The view, which is also shared by many developing countries, is that Indian drugs and pharmaceuticals companies have enjoyed a weak patent regime for far too long.

But, they say that even the fresh proposal has not found much support from developing countries. Only the EC has supported India and that too on the condition that certain changes be incorporated in the proposal.

They say that even if India is able to push for its proposal, its patent laws will have to be amended for a more stringent compulsory licencing regime and for government use of patents. For instance, an Indian firm which secure a compulsory licence will not be able to use the commodity for export purposes.

Though the Indian Patents Act has a provision for compulsory licencing, it covers product patents not applicable to foods, pharmaceuticals and chemicals. A more simplified version referred to as the automatic licence of right also exists.

While most officials are tight-lipped about India's stand on other articles under trade-related aspects of intellectual property rights, some say that once India accepts the article 31 on TRIPS, it will have little room to maneuver.

Drug industry sources, however, say that in meetings with the government, considerable pressure has been brought to bear on them to accept product patents. They feel that India will have to accept a more stringent patent regime sooner than later.

RR MEDI PHARMA TO MAKE IV FLUIDS

RR Medi Pharma Limited, a Madras-based company which is setting up a unit for the manufacture of intravenous fluids (IV fluids) in disposable medium density polyethylene (MDPE) plastic bottles, is shortly entering capital markets with its maiden public issue of equity shares at par.

The company is promoted by **Mr. V. Raman** alongwith TIDCO in the associate sector. Mr. V. Raman a professional executive of proven track record of achievement was until recently the chief executive of the KCP Ltd. The project is for the manufacture of IV fluids in disposable medium densi polyethylene (MDPE) plastic bottl using the state-of-the-art, "Form-Fi Seal" (FFS) technology. The installe capa-city of the plant will be 140 lak bottles per annum (lba).

The total cost of the project Rs. 11.43 crores and is being funde with an equity capital of Rs. 446 lakh along with term loan assistance fro ICICI and IFCI to the extent of Rs. 27 lakhs. The foreign currency loan c Rs. 400 lakhs was sanctioned by IDB under "World Bank IBRD line c Credit." The promoters have brought i Rs. 286 lakhs and the balance c Rs. 160 lakhs is being offered to th public.

IV Fluids being an essential lif saving item, the demand is growing a about 5 per cent per annum. With a increasing awareness of medicare an health care, the demand for IV Fluid in FFS bottles is expected to increas from 805 lba in 1990-91 (about 42 pe cent) to about 1680 lba in 1995-9 (about 60 per cent).

There is no unit adopting the Form-Fill-Seal technology in the four Southern States and RR Medi Pharma will be the first of its kind in this part of the country.

RR Medi Pharma with its installed capacity of 140 lakh bottles per annum (lba), will have a major share of this market. Being in the joint sector with TIDCO, RR Medi Pharma would enjoy price preferences in all Tamilnadu Government purchases.

The neighbouring Asian and African countries are expected to import about 300 lakh bottles per annum from India in 1995-96. Since the FFS technology is widely accepted and used in western countries, RR Medi Pharma will give a special thrust and concentrate in the area of exports. The company is coming out with an equity issue at par in July.

BULK DRUG IMPORTS:

Finance Ministry rejects proposal for duty reduction

Prices of a wide-range of drugs are slated to go up by 5 to 15 per cent, following rejection by the Finance Ministry of a proposal to bring down the import duty rates of bulk drugs.

The Finance Ministry's views were put forward at an inter-ministerial meeting held under the aegis of the Cabinet secretary recently. The meeting was attended, among others, by the Finance and Health Secretaries.

The Department of Chemicals and Petrochemicals is expected to initiate the price hike exercise shortly. Having done a similar routine in July last year, following the devaluation of rupee, the department is confident that the exercise could not take more than 10 days to complete. An expeditious price revision has become imperative given the fact that shortage of key drugs has already been reported from the market.

When contacted, the Minister of State for Chemicals and Petrochemicals, **Dr. Chinta Mohan,** said that the Finance Ministry's views will be examined before any decision is taken. A last-minute effort to seek the intervention of the Prime Minister or of the Finance Minister to avoid an immediate price increase is not ruled out.

The Department of Chemicals and Petrochemicals had been lobbying hard for a reduction in the duty rates of bulk drugs and intermediates by 15 to 20 per cent in order to negate the higher cost of foreign exchange in the market. The Finance Ministry had earlier ordered that all such imports be made by buying foreign exchange in the free market.

In fact, the department had earlier pushed for putting drug imports back on the official exchange rate, on the ground that calibrating imports to a fluctuating open market value will entail frequent price revisions. It was argued that the department lacked the necessary infrastructure to announce revisions of hundreds of formulations on a regular basis. This demand, however, was rejected by the Finance Ministry. As a fall back, the Chemicals and Petrochemicals Department wanted a cut in the import duty rate — to below pre-budget levels.

The Finance Ministry is of the opinion that duty rates should not be linked to fluctuations in the prices prevailing in the foreign exchange market. Such a move does not make for fiscal discipline as duty rates will have to be changed frequently to keep pace with fluctuations in the exchange rate.

The Ministry has instead suggested that the announcement of the drug policy should be expedited and decontrol of drug prices should be enforced on a wide-scale, in order to avoid the pitfalls of keeping a tab on the prices of hundreds of finished drugs. Frequent price revisions can also be avoided if prices are decontrolled.

The Finance Ministry's views about the need for a quick announcement of a liberal drug policy found support from the Ministry of Health and the Cabinet secretary. The meeting was informed that a new policy is under formulation.

The Finance Ministry also argued that the question of tariff reduction cannot be tackled on an isolated basis and an economy-wide view will have to be taken. An exercise is on this direction, it was claimed.

Objections also came in from the Department of Revenue against a duty reduction as it would have entailed a revenue loss of Rs. 60 crores — something which the Finance Ministry can ill-afford at this juncture.

DUTY CUT LIKELY ON 120 ESSENTIAL DRUGS

The Department of Chemicals a Petrochemicals is contemplating a in the import duty of 120 essential dru following a review of the duty structu of these formulations undertaken at t instance of the Prime Minister, **Mr. N rasimha Rao.** These drugs have a hi component of imported intermed tes. The review is being done by t Department in consultation with t Ministers of Finance and Commerc The imported intermediates constitute much as 30 per cent of the drugs many cases. Since the devaluation rupee in July 1991 and the subseque hike in market rate of dollar, cost importing intermediates has shot up

The department officials are keen o an early decision as despite period revision of prices, most notified bu drugs and formulations remain unrem nerative. The lot of manufacturers wh are forced to import is particularly men tionable in this regard as the notifie prices are fixed taking into account th domestic production costs of raw stock whereas the imported costs are in man case three fold more.

GLAXO REPORTS 18% INCREASE IN SALES; PROFITABILITY DOWN

Glaxo (India) Limited has reporte gross sales for the year ended 31 March 1992 at Rs. 488.36 crores a compared to Rs. 410.77 crores last yea which reflects a growth of over 18% Profits declined due to rigid price con trol of drugs and pharmaceuticals whic prevented adequate neutralisation c steep increases (arising from the Gul War and Devaluation) in the cost of rav and packing materials, utilities an financing charges. The company's othe businesses, notably foods and fin chemicals performed well. The com pany proposes to declare a dividend o 18 per cent for the year.

GSFC records highest ever profits

The highest ever Rs. 1,000-crore rnover and other income, highest ever oss and net profits and a higher equity vidend at 33 per cent on the enhanced quity capital are the major highlights the excellent performance of Gujarat tate Fertilisers Company (GSFC) for e year ended 31st March, 1992. Other ote worthy features of the performance nder review include new records in roduction and marketing, improved erformance of the polymer unit and uccessful commissioning of the major lants of the caprolactam expansion project which is nearing the commissiong time.

The company's Chairman **Mr. H.K. Khan** disclosed this at a meeting of the oard of Directors held at Fertilisernaar on June 10, to consider and approve ne accounts and reports for the year nded 31st March, 1992.

The directors noted that by crossing s. 1,000 crore mark of turnover and ther income, GSFC registered an ncrease of 33 per cent over the previus year's record of Rs. 752 crores. The otal fertiliser production including that f Sikka DAP plant achieved a new vatermark of 12.94 lac mt with an averge capacity utilisation at 125 per cent s against 12.11 lac mt with 116 per cent apacity utilisation of the previous year.

The various plants of industrial proucts also did exceedingly well achievng over 100 per cent capacity utilisation anging from 101 per cent to 158 per ent. Plants of the GSFC's polymer unit chieved a new watershed in production vith a higher capacity utilisation rangng between 81 per cent to 99 per cent s compared to 79 per cent to 93 per ent of the previous year.

In view of the all round improved perating performance, GSFC has ecided to increase the equity dividend rom Rs. 3 to Rs. 3.30 per share on the nhanced equity share capital of Rs. 0.15 crores after the issue of shares to the shareholders of Gujarat Nylons Ltd., which is merged as a fibre unit with GSFC last year. The dividend outgo on share capital would absorb Rs. 19.89 crores as against Rs. 18.08 crores disbursed last year.

The company's gross profit has increased by 21 per cent to Rs. 136.85 crores from Rs. 112.90 crores of the previous year. After adjusting depreciation of Rs. 51.31 crores (previous year Rs. 43.93 crores), the pre-tax profit stands remarkably higher at Rs. 85.54 crores compared to Rs. 68.97 crores in 1990-91.

The company's net profit after tax amounts to Rs. 71.69 crores registering an increase of 11 per cent over the net profit of Rs. 64.67 crores in the previous year. Consequently, the earning per share (EPS) has also gone up to Rs. 11.92 from Rs. 10.85 of the previous year. After bringing forward balance of profit & loss account of Rs. 4.15 crores of last year, the total net profit comes to Rs. 75.84 crores as against Rs. 69.19 crores of the previous year.

After transfer of Rs. 35 lac to 'Capital Redemption Reserve' created for redemption of 35,000 11 per cent Redeemable Cumulative Preference shares of Rs. 100 each due for redemption in January 1993, Rs. 12.50 crores for redemption of Non-convertible debentures, the balance available for appropriation stands at Rs. 62.99 crores (previous year Rs. 40.23 crores).

The Reserves & Surplus on 31.3.1992 of Rs. 432.56 crores (previous year Rs. 381.32 crores) convey an impressive financial strength with an enlarged equity base of Rs. 60.15 crores. As a result, the net worth has also improved further to Rs. 493.06 crores from Rs. 441.25 crores at the end of the previous year.

The chairman informed that the company would strengthen its position as a leader in the petrochemical field when the 50,000 mt per annum capacity caprolactam expansion project would be commissioned around September during the current year.

The company would achieve self sufficiency in power generation when the third phase of co-generation of steam and power project which is now in the advanced stage of construction would go on stream. The company's 1,000 mt per day capacity sulphuric acid project now heading towards completion would meet the captive consumption of the various plants.

Work initiated on the 1,350 mt per day capacity ammonia expansion project would be accelerated during the current year. The chairman further informed that the company had decided to further widen the base of diversification and finalised arrangement for establishing 10,000 mt per annum capacity melamine expansion project, 5,000 mt per annum capacity citric acid project and 75,000 mt per annum capacity acrylonitrile project.

All these projects would require a capital outlay of around Rs. 2,000 crores for which, he added, further financial tie-ups will be necessary including mobilisation of resources through Euro-equity and public issue of equity shares.

For the time being, the chairman indicated, in order to finance partly expansion of co-generation facility, modernisation programme, sulphuric acid expansion and overrun of caprolactam expansion and to augment long term resources, the company has decided to issue secured redeemable partly convertible debentures aggregating to Rs. 225 crore. Each debenture valued at Rs. 350 would consist of convertible portion of Rs. 200 to be converted into one equity share of the face value of Rs. 10 each and non-convertible portion of Rs. 150. The chairman hoped that the issue will be fully subscribed.

PPL commissions phosphoric acid pla

Paradeep Phosphates Ltd. (PPL), has successfully commissioned its phase II project to produce six lakh metric tonnes of sulphuric acid and 2.25 lakh mt of phosphoric acid annually. PPL Managing Director **Mr. C. Mohanty** said the company had succeeded in developing a production technique, whereby micronutrient sulphur would be made available in its diammonium phosphate (DAP) for the first time in the country.

The company, which completed its phase II on May 30, has posted a record cash profit of about Rs. 32 crore and a net profit of Rs. 16 crore for 1991-92. The company's turnover went up more than 150 per cent from Rs. 320 crore in 1990-91 to Rs. 820 crore in 1991-92. It has recorded an all time high capacity utilisation of 89 per cent in the DAP plant despite shortage of raw materials and other problems, Mr. Mohanty said.

The company marketed over one mt of DAP and three lakh tonnes of urea during 1991-92. Mr. Mohanty said that since PPL was the largest DAP producer in the country, Indian farmers would derive immense benefit from the availability of sulphur in DAP.

During 1991-92, PPL successfully imported DAP in western ports of the country. It accounted for 25 per cent of imported DAP during 1991-92. PPL has received an award from Jawaharlal Nehru Port Trust authorities for the highest handling of finished fertilisers in 1991-92. All India fertiliser sales of PPL jumped from 7,00,000 mt during 1990-91 to 13,02,000 mt during 1991-92.

The company had spent crores of rupees for making the environment pollution free. For PPL it was a continuous process and further investment was planned during the Eighth Plan period, Mr. Mohanty said.

The company's product has become popular in all the states because q... quality and after sales service provi to large number of farmers all over country. The company has also un taken various agricultural developm programme including adoption of lages in various states of its operat

Considerable emphasis is laid by company on organising agricultu educationl and service activities for farming community. Mr. Mohanty s PPL had adopted 6 cluster of villag each having 3 villages in different sta with the aim of achieving integra rural development. He said dur 1990-91, PPL had organised 105 fi demonstrations, 73 field days, farmers' meetings, 4 crop seminars training camps and 13 rural exhibitio in different states. PPL had cert long-term and short-term goals improvement profitability.

In the short-term goals, PPL w planning to install pipe cross reactors increase production capacity of DAP 9,00,000 mt per year. PPL furth planned to put flourine recovery pla which is also required to meet enviro ment control stipulation. In the lon term goal, PPL was planning for do bling phosphoric plant and sulphu acid plant capacity. The cost of expa sion project at Paradeep was likely be much less than setting up a grassro plant of similar capacity elsewhere India. It also envisaged optimum uti sation of infrastructure already built by PPL, Mr. Mohanty said.

ZUARI AGRO CHEMICALS TO PAY 25 PER CENT FINAL

The Directors of Zuari Agro Ch micals have recommended a final div dend of 25 per cent, making a total div dend of 40 per cent with an interim di dend of 15 per cent already paid for t year ended March 1992. In the prev ous year, the company paid a div dend of 32.5 per cent for the yea 1990-91.

SSP units yet to be paid subsidy arrears

Fertiliser Department is still holding up the payment of subsidy arrears, amounting to about Rs. 100 crores, despite a Delhi High Court order in January.

The Delhi High Court in its order had directed the Department of Fertilisers to make the subsidy payment, held up by the Fertiliser Industry Co-ordination Committee, to the SSP units immediately as 24 of them had already closed down since December on account of financial crisis.

In fact, the Department had assured the Fertiliser Association of India last month that the payment due to the SSP units would be released without any delay, in view of the grave situation being faced by the SSP units.

The SSP units had moved the Delhi High Court in December, challenging the arbitrary fixation of a subsidy ceiling of Rs. 890 per tonne of SSP in November. The fixation of the ceiling on subsidy to SSP units resulted in a minimum loss of Rs. 370 per tonne to all the SSP units.

Although the government later increased the ceiling by Rs. 436 per tonne, the costs of inputs had gone up by Rs. 675 per tonne because of sharp increases in the prices of rock phosphate and sulphur, two key raw materials used by SSP units.

The difference in the actual production cost increase and the subsidy allocation by the government thus amounted to about Rs. 100 crores in January. The sources say the government's revision of the subsidy rates is on the basis of the landed cost of the imported rock phosphate and sulphur for the July-September quarter of last year. The government had also not considered the increased rail freight and packaging costs, the sources said.

Meanwhile, the SSP production in the country is expected to be considerably lower this year as there is no sign of reopening of the closed fertiliser units in the near future. As against a production of 2.56 million tonnes of phosphatic fertilisers achieved in 1991-92, the current year's production is expected to be 2.3 million tonnes.

FERTILISER PRICING: PARLIAMENTARY COMMITTEE TO SUBMIT REPORT IN AUGUST

The Government has been forced to defer its decision on the revision in fertiliser prices as also decontrol of the industry owing to the two-month extension given to the Parliamentary committee that is going into issues relating to the industry.

The committee, which was originally supposed to submit its report on June 10, is now likely to do so on August 10. Consequently, the new fertiliser policy will not be announced in July as was expected. Sources say that the government may not be able to take up this issue at all in the monsoon session of Parliament beginning on July 8. In fact, it is unlikely that any decision will be taken before October.

They say that after The Parliamentary Committee submits its report, the Fertiliser Department as also the Finance Ministry will have to discuss it. Subsequently, it will have to be cleared by the Prime Minister's Office, the Cabinet Committee on Economic Affairs and the Cabinet Committee on Political Affairs before the new policy can be implemented. Owing to the large political representation on the committee and the political ramifications of any decision, it is expected that every issue will be keenly debated before a decision is taken.

Nagarjuna fertilisers to commence urea supplies soon

Nagarjuna Fertilisers and Chemicals Ltd. (NFCL) is all set to roll out urea on June 25. The Rs. 1,127-crore project located in the coastal town of Kakinada is the biggest private sector project in Andhra Pradesh. **Mr. P.V. Narasimha Rao,** Prime Minister, is scheduled to formally inaugurate the project some time next month.

The original cost of the project, based on prices prevailing in 1986, was estimated at Rs. 635 crores. However, delays in various approvals resulted in cost escalations. According to **Mr. K.V.K. Raju,** technocrat entrepreneur and promoter of Nagarjuna group, steep increase in foreign exchange rates and increase in interest alone have contributed to Rs. 311 crores out of the total cost increase of Rs. 492 crores. The cost escalation will be met through a partly convertible debenture issue, which the company is proposing shortly. Delay in supply of gas by Gas Authority of India Ltd. (GAIL) also contributed to cost escalation.

The company received the gas only on May 8. However, as the saying goes, all is well that ends well. The fertiliser plant is the first one to come after commissioning of Indo Gulf Fertiliser in 1988. It is located in the midst of a high fertiliser consuming zone. The project has a special advantage of having a ready market at the doorstep. East and West Godavari, Krishna and Guntur are among the top fertiliser-consuming districts in the country.

The Nagarjuna fertliser project, from the inception, was beset with problems. The project was conceived way back in 1973. The project, which was sought to be implemented by the Government of Andhra Pradesh and the Shaw Wallac group did not take off. Thereafter th project was sought to be implemente by **Mr. K.K. Birla** of Zuari Agro Ltd However, this arrangement too did no work and the project reverted to th State Government.

Subsequently the Galadaris, a NR group based in UAE, also showed inter est in the project, but the proposal di not fructify. It was in 1985 that the Nag arjuna group came on to the scene an implementation of the prestigious pro ject was entrusted to it.

The group, started with a modes investment of Rs. 5 crores in 1975, an has an asset value of over Rs. 1,30 crores today. It has significant presenc in core areas like steel, fertiliser an chemicals and financial services. Wit the project humming in June 25, th group is all set to rank along with Tata and Birlas, the private sector giants who have and are making dent in th field.

The first gas-based plant in Sout India, Nagarjuna Fertilisers, is based o current highly energy-efficient techno logy from Snamprogetti for the ure process and Holdor Topsoe for th ammonia process. It has an installe capacity of 5 lakh tonnes of urea pe annum. The plant has improved desig taking into account the experience o earlier projects and is expected to b highly productive.

The project has unique advantage o having the source of raw material in th same district, within a distance of less than 100 km. Supply of natural gas from Krishna-Godavari basin will meet its entire requirement of 1.3 million cubic metres per day.

The fertiliser complex comprises a 900 tonne a day ammonia plant an 1,500 tonnes a day urea plant, with the necessary off-site facilities like storage tanks, water treatment plant, gas receiv- ing and melting station and effluent treatment plant etc.

In the ammonia plant, the natural gas (predominantly methane) is made to yield carbon dioxide and ammonia by using steam and nitrogen from ambient air. The product ammonia is pumped to the urea plant, retaining a part of it in storage tanks. In the urea plant, ammonia and carbon dioxide mix to form ammonium carbonate which turns to urea and steam in the urea reactor. The molten urea is pumped to the top of the prilling tower, where it is showered from the rotating prilling bucket, coming in the process into contact with natural draft air. As a result of this cooling, the urea droplets solidify into prills which are then transported to the silos or to the urea bagging plant.

The NFCL plant has a built-in pollution control system. Liquid effluents are treated and disposed of using process condensate treatment facilities in both the ammonia and the urea plants. They are further treated in the condensate polishing section and used as demineralised water for boiler feed. The other liquid effluents generated in the plants are sent to the effluent treatment section to ensure the surface discharge quality standards of ISI, and later pumped into the green belt of the factory.

As for air pollution control, all the process vents of toxic and inflammable gases are sent to the stacks and flared so that there is no discharge of such gases into the atmosphere. The urea prilling tower has a de-dusting system which ensures that the urea dust carryover into the air is minimised and much less than the admissible level.

In addition, the large green belt area being developed in the project site is a man-made forest, with a lot of animal and marine life in it, and serves as the bulwark against any possible industrial pollution of the atmosphere in Kakinada town. A unique feature is that each one who visits the factory site is made to plant one sapling in the green belt, and the number has crossed several lakhs.

Even as the project was taking shape, NFCL has popularised its brand name in its high-fertiliser-consuming hinterland, which includes Andhra Pradesh, Orissa and Madhya Pradesh, by market-seeding the product through an outlet of 2,800 retailers. It is also marketing pesticides under its brand name, with the ultimate aim of providing a unique agricultural supermarket under one roof to its consumers.

The project is managed by professionals from the fertiliser industry. It was the first fertiliser unit to secure deemed export status for the parts and components procured indigenously.

However all the critical components procured from abroad were shipped after obtaining third party inspection, so that there would be no malfunctioning once they were installed.

Even the State-of-the-art computer system, which monitors all critical equipment functioning, is of the latest generation. The company is confident of servicing shareholders in 1994 since working during 1992-93, would be only for nine months. The present production of urea in all domestic units is about 13 million tonnes per annum against the demand of 15 million tonnes. The demand for urea is growing at 5 per cent per annum. The gap between demand and supply is met through imports.

ZERO-EFFLUENT DISCHARGE BY NFL UNIT

The Panipat unit of National Fertilisers Ltd. (NFL) has emerged as the first zero-effluent discharging fertiliser plant in the country. The sophisticated liquid effluent treatment system installed at the unit removes all harmful chemical ingredients from the factory discharges by physico-chemical and bilogical treatment and uses the recycled water for irrigating the orchards and tree plantations around the factory.

Fertiliser output up 9%; demand up by 1%

Fertiliser production in the country grew by 9 per cent in 1991-92 despite the adverse trends in industrial growth during this period. The country achieved a production of 2.5 million tonnes in the case of phosphatic fertilisers against a target of 2.7 million tonnes. This was higher than the level of 2.05 million tonnes achieved in 1990-91.

The production target of 7.3 million tonnes for nitrogenous fertilisers was almost achieved. In 1990-91, production of nitrogenous fertilisers was 6.9 million tonnes. The 30 per cent rise in fertiliser prices during the year seems to have taken its toll as consumption which was projected to reach 13.6 million tonnes actually realised only 12.7 million tonnes, a mere one per cent more than the 1990-91 figure of 12.56 million tonnes.

However the gap between the demand and supply was met through drawing down on inventories due to lower imports during the year. Inventories of nitrogenous fertilisers fell to six lakh tonnes on March 1, from around 10 lakh tonnes in the previous year. Stocks of phosphatic fertilisers on the other hand were marginally higher at 2.98 lakh tonnes.

There was significant improvement in the performance of phosphatic fertiliser plants with capacity utilisation rising from 75 per cent in the previous year to 95 per cent in the year ending March, 1992. The average capacity utilisation in the nitrogenous fertiliser producing plants was 90 per cent.

The overall performance of the industry was positive despite a fall in production of single superphosphate. This segment of the industry has been operating at sub-optimal levels since August last as a result of the arbitrary ceiling for subsidy below reasonable cost of production and distribution that was imposed on the industry with effect from July 25, 1991. Sources say that fertiliser production in the country would have crossed 11 million tonnes tonnes had it not been for the dismal performance of this sector.

Prospects of sustaining this performance in the current year seem bleak as this industry is in the midst of transitional problems in distribution of imported raw materials, like rock phosphate and sulphur, after the decanalisation of imports. Further, subsidy payments to the industry have now been held up as the government has exhausted the amount earmarked for this quarter. As it is industry circles have been complaining that the Rs. 5,000 crores provided by the budget for payment of subsidy this year is not enough as it includes a spillover of Rs. 1,400 crores of payments due from last year.

Outstandings on account of subsidy payments are further expected to mount as input costs continue to rise. The sharp devaluation of the rupee last year had rendered imports like rock phosphate, sulphur, ammonia and phosphoric acid more expensive. Correspondingly, the customs duty on imported phosphoric acid had also gone up. The full impact of these developments will only be experienced this year.

FERTILISER FIRMS TO HAVE WIDER CHOICE OF TECHNOLOGY

The government has finally agreed to allow fertiliser companies a broader range of technology to choose from for the production of nitrogenous fertilisers. However, such technology should be tried and tested.

The decision taken earlier this month is an important departure from the existing policy, which restricted the choice of technology to only two companies. A formal announcement is likely to be made shortly.

The government has now drawn up a list of companies with proven technology and wide experience. Fo[r] ammonia production, the list is said t[o] include Kellog and C.F. Braun of th[e] US, UDHE and Linde of German[y,] Toyo of Japan and ICI of UK. So fa[r] fertiliser companies were limited t[o] using technology only from Haldo[r] Topsoe, the Danish affiliate of the Ita[lian] company, Snamprogetti.

For the manufacture of urea, th[e] Dutch company Stami-Carbon, Tecni[mont] of Italy and Toyo will be the majo[r] competitors for Snamprogetti.

Officials say that the government ha[s] evidently restricted its choice to ensur[e] that the subsidy burden does not rise. I[f] all restrictions are removed, there is a[n] inherent danger that all forecasts of pro[ject] costs will be upset, they say.

Kellog is the only other Multinationa[l] Company (MNC), apart from Haldo[r] Topsoe and Snamprogetti, to be give[n] a contract. The Kellog plant at Hazir[a] attained a capacity utilisation of 120 pe[r] cent in the first year, but it was neve[r] given a repeat order.

In fact, NFL, which had opted fo[r] Kellog technology for its Vijaipur pro[ject], was told that only Haldor Topso[e] and Snamprogetti technology could b[e] used.

CFTRI SCIENTIST BAGS AWARD

Dr. A.M. Nanjundaswamy, a senio[r] scientist of CFTRI, Mysore, has bagge[d] the prestigious Prof. V. Subrahmanya[m] Industrial Achievement award for th[e] year 1991 for his contributions in th[e] field of food science and technology an[d] the development of agro-based food an[d] allied industries in India.

The award was presented recently a[t] Bombay during the national seminar o[n] "Challenges to the Indian food indus[try] — widening of export and domes[tic] markets."

Two gas-based fertiliser plants mooted for Tripura

Two fertiliser projects, each having a capacity of 600 tonnes per day of ammonia, are likely to be set up in the joint sector in Tripura at an estimated cost of Rs. 1,300 crores. Each plant will also have a capacity for producing 1,100 tonnes per day of urea.

Sources say that apart from an NRI, KRIBHCO and the R.P. Goenka group have evinced interest in these projects. The Ministry of Chemicals and Fertilisers has convened a meeting on June 19 to discuss the modalities, including the financial arrangements, for setting up these plants.

Ministry officials say that details of transport arrangements to and from the plants have already been worked out. However, the issue of transportation of heavy equipment at the erection stage, is still posing some problems. Senior officials say that for this, access through the waterways in Bangladesh will be crucial.

It is in this context that the Tin Bigha issue assumes greater significance. Sources say that despite keen interest shown by the Bangladesh Prime Minister Ms. **Khaleda Zia** during her recent visit to the country, the implementation of these plans may be jeopardised if the issue is not amicably resolved.

Even the favourable economic aspects of the proposal, by way of providing business opportunities in the field of transport in Bangladesh, may be ignored if the political climate is not conducive.

Experts, however, strike a different note. The transport bottleneck in this region, they say, is a major stumbling block for any potential investment. The plants in the north-eastern states have faced severe problems with the railways, in transport of both raw materials and the finished fertilisers.

According to a senior official in the Fertiliser Ministry: "The government is aiming at a 90 per cent self-sufficiency in the supply of nitrogenous fertilisers in the long run. For this it would be necessary to put up at least one new plant every year."

With the projects already under implementation, this objective will be met till 1996-97. Nagarjuna Fertiliser begins production this year, Chambal Fertilisers is expected to be commissioned in 1993-94, Tata Chemicals and Fertilisers in 1994-95, the Oswal project in 1995-96, and the expansion of IFFCO and National Fertilisers Limited is expected to be completed by 1996-97.

Sources point out that the government is now seriously contemplating new projects to plan for the period after 1996-97. Setting up of new projects in Tripura will have several advantages as this will not only resolve the problem of utilisation of gas reserves in the state, but will also provide direct employment to the people of the region in addition to bridging the gap between demand and availability of fertilisers in the country.

By the year 2000, India is expected to face a deficit of 3.85 million tonnes of nitrogenous fertilisers and any attempt to bridge this gap means that the government will have to take bold decisions to augment production.

As it is, the present import bill for raw materials for phosphatic fertilisers and potash is a whopping $2 billion annually.

HFC MAY LOSE FERTILISER EDUCATION PROJECT TO NGOS

The uncertain future of Hindustan Fertiliser Corporation (HFC) is believed to have led the Overseas Development Agency (ODA) of the British government to take a second look at the continuation of the Indo-British Ferti Education Project (IBFEP) through chronically sick public sector fertil company. Instead, ODA, it is lea might opt for some non-governm organisations (NGOs) for implement various schemes already launched un IBFEP.

IBFEP was launched in 1981 in s eral eastern states initially for five ye with a corpus of Rs. 22 crores. The p ject was subsequently extended another five years and a sum of Rs. crores was granted by the British go ernment for the second phase.

An additional Rs. 9 crores was san tioned for continuation of the project f another year. With little prospect more funds becoming available no from ODA, the future of the schem under IBFEP has become somewh uncertain. Precisely for the same reaso the rainfed farming project too is limbo. The rainfed farming project als supported by ODA was launched 1989 with a fund of Rs. 6 crores for fiv years.

Mr. Shyamal Banerjee, who wa earlier the general manager (marketing of HFC and now heads a team of pro fessionals assembled under a new com pany called Ex-Fertiliser Servicemen Marketing & Consultancy Pvt. Ltd. said his organisation was prepared to take upon itself the job of implement ing various schemes under IBFEB. This was because, as Mr. Banerjee explained the people who had assembled under the new organisation were actively respons ible for smooth execution of those schemes till recently.

Mr. Banerjee indicated that ODA had already identified certain NGOs for entrusting with them certain jobs like benchmark studies and monitoring and evaluation of the projects. There was no reason why the new organisation with so much of human resources at its disposal would not be able to do the same jobs successfully, he observed.

year. The other project vinyl sulphone is under implementation which is expected to go into commercial production in November.

DIAMMONIUM SULPHATE:

Concern over plan to do away with import subsidy

The All India Kisan Sabha (AIKS) and the All India Agricultural Workers Union (AIAWU) have expressed concern over the reported move to remove the import subsidy for diammonium sulphate and to increase the administered prices of nitrogenous fertilisers to save Rs. 2,500 crores.

Expressing the apprehension that it would result in a 30 per cent rise in the price of the fertiliser at a time when 85 districts of the country were reeling under the impact of drought and several others were on the border line with delayed monsoon, the organisations have said such an economy measure would prove to be "disastrous".

In a statement, **Mr. P.K. Tandon** and **Mr. Suneet Chopra**, Joint Secretaries respectively of AIKS and AIAWU, have said the danger signals were already visible in most of the states. Even in Haryana, on account of the dry weather and high prices, the fertiliser use had declined between 30 and 60 per cent. This would have a "devastating" effect, particularly on the small and marginal farmers constituting about 76.6 per cent of all holdings, they said.

Not only was the output of foodgrains likely to fall during the coming harvest, forcing food prices "sharply" up again this year, they said, affecting the poor peasants who were already the worst sufferers of the last year's price rise but it would also lead to starvation among the poor. They said the fall in production resulting from a cutback in fertiliser use would also adversely affect the number of days' employment available for agricultural workers, a reduction in already depressed section comprising, mainly scheduled castes and tribes, could ill afford. "Such measures are false economics", the statement said. The country had already exported eight lakh tonnes this year at half the price which it had to pay for importing a million tonnes. Also, it was evident that those who were starving would not take such measures lying down and the cost of quelling rural unrest would be even more, the statement said.

The rise in fertiliser prices was coming in the background of proposed hikes in electricity rates, irrigation charges and administered prices of many other inputs. This would further compound the already deplorable condition of the peasantry and the agricultural labour. The Government must either ensure that it did not happen or face the anger of the rural poor, the statement warned.

RECORD OUTPUT BY UDAIPUR PHOSPHATES

Udaipur Phosphates and Fertilisers has achieved a record production and sales of single superphosphate (SSP) at 82,202 tonnes and 80,205 tonnes, respectively during the year ended March 1992, according to a press release. Chlorosulphonic acid plant adding a new product line was commissioned in May 1991. As per the unaudited results for the year, the turnover is up to Rs. 26.06 crores from Rs. 19.23 crores. The gross profit has risen to Rs. 170 lakhs from Rs. 158 lakhs. Delay in disbursement of subsidy on fertilisers by the Government and steep increase in the interest affected the profit.

The net profit has dropped to Rs. 93 lakhs from Rs. 104 lakhs after depreciation (Rs. 65 lakhs against Rs. 54 lakhs) and taxation (Rs. 12 lakhs against nil). The company is going ahead in its diversification plan by acquiring an ongoing concern manufacturing fine chemicals located at Baroda which commenced production in March this year.

UK FIRM PIPS BHEL TO BAG IOC CONTRACT

Bharat Heavy Electricals Ltd. (BHEL) has lost the race for a Rs. 80-crore IOC contract to a British firm, Ruston, for supply of three gas turbines, boilers and auxiliaries for a World Bank-sponsored IOC project in Assam. Indian Oil Corporation plans to build up a 15-mw power plat for captive use in Digboi.

In fact, BHEL was fighting a loosing battle right from the outset when in April, 1991, it had quoted for the contract along with two others — Solar of the USA and Ruston of the UK. The specifications of the tender gave little chance to BHEL and appeared to be in favour of the British company Ruston. The tender requirement was for three 5-mw gas turbines when it was known to IOC that BHEL produces turbines of a minimum capacity of 6.9 mw. Ruston produces 5-mw turbines and Solar 6 mw. BHEL turbines had higher power output advantage. But turbines with higher output were not given any advantage in the evaluation. It is not as if IOC does not require more power for its operations in Assam. It regularly purchases from Assam State Electricity Board. So IOC could have easily passed off the cost of advantage of additional power generated to its sister units in Digboi itself.

On the tender opening date — April 2, '91 — BHEL quoted at Rs. 90 crores, against Rs. 75 crores quoted by Solar and Rs. 80 crores by Ruston. But after the rupee devaluation, Ruston's quotation stood at Rs. 108 crores and Solar's at Rs. 105 crores. Luckily BHEL quotation stood at Rs. 100 crores. But the World Bank prevailed on IOC that the exchange parity rates on the date of tender opening should be taken as the basis of evaluation.

Reliance's Jebel Ali refinery approved

The plan of Reliance Industries Ltd. (RIL), to enter the oil refining sector in a big way has received a major boost with the government clearing the company's proposal for a refinery to be set up at Jebel Ali in Dubai.

This is the first offshore refinery cleared by the government, and comes close on the heels of a letter of intent issued to RIL for a 9 million tonnes refinery in Gujarat. The company had applied for a 6 million tonne export-oriented refinery in the Jebel Ali free trade zone in 1989. However, it was not actively pursued either by the government or by the Ambanis following disturbances in the Gulf.

In a recent meeting, however, the interministerial board for EOUs and joint ventures cleared the project and a letter is expected to be issued shortly, according to officials in the Commerce Ministry. The Rs. 3,500 crore refinery is proposed to be set up as a joint venture. Officials, however, could not tell whom the Ambanis have chosen as partner for the project. Indications are that it might be the Japanese multinational, C-Itoh, their financial collaborator in the Gujarat refinery.

The refinery aims at dedicating its entire product range to India. The product range includes liqufied petroleum gas (LPG), gasolene, high-speed diesel (HSD), fuel oil and bitumen. All these products are in short supply in India and are currently being imported. The main reason for setting up the project in Jebel Ali is that it is a free port area, offering advantages like 100 per cent foreign ownership, no sponsorship restrictions and 100 per cent repatriation of profits and capital.

The other advantage for RIL is that its Chairman, **Mr. Dhirubhai Ambani,** knows the area very well, having worked there for several years in oil refineries owned by European multinationals. Besides, crude oil can be directly offloaded at the plant site and the products can be directly loaded on the cargo tankers, eliminating the transport requirement from the port to plant site.

While RIL will have its hands full in the coming years to commission the two oil refineries, it will also have to raise huge resources to finance them. C-Itoh has agreed to meet the entire foreign-exchange requirement for the Gujarat refinery to come up in Salaya near Jamnagar.

RESENTMENT AGAINST STC'S RUBBER PRICE HIKE

The decision of the State Trading Corporation of India (STC) to release stockpile rubber RSS-III and SMR-20 at Rs. 26,000 per tonne has expectedly elicited a strong reaction from the rubber industry. A press release from the All India Rubber Industries Association says that the STC is making abnormal profits on the commodity which it bought from the market at less than Rs. 21,000 per tonne. Moreover, the STC's action has fuelled market prices which have zoomed to Rs. 26,500 per tonne against the bench-mark price of Rs. 21,450 fixed by the government. This amounts to an increase of 23.5 per cent and means that RMA-4 rubber will now cost Rs. 30,000 per tonne at Kottayam, inclusive of taxes and cess.

The situation has been exacerbated further by the scarcity of the commodity arising from exports of rubber by the STC at a loss. The release says that the government could not have been unaware of the detrimental effects of high release prices on the local market. Last year, higher STC release prices not only induced the lower market prices to seek same levels, but the small quantity of rubber released by the STC governed the price of entire quantity in the market. The growers were thus induced to charge exhorbitant prices at the cost of consumers, the release adds. The government ignored the warnings of the rubber consuming sector at a time when it is struggling to regain its normal growth rate of 8% against the low of 4% recorded in 1991-92.

The industry has also criticised the STC's move to release locally procured RMA-IV rubber at the same price of Rs. 26,000 per tonne ex-Kottayam, excluding taxes, for May/June 1992.

This price is proposed to be increased further by Rs. 500 per tonne for July and August. The release points out that the bench mark price is fixed as a remunerative price under the revived buffer stock scheme with a view to stabilising local market price at that level. However, whenever the price falls even marginally below the bench-mark level, the government promptly asks the STC to start purchasing rubber so as to buoy market prices.

MRL'S THANJAVUR FACILITY COMMISSIONED

The President **Mr. R. Venkataraman** has commissioned the Rs. 114 crore mini-refinery unit of the Madras Refineries at Nagappattinam, which would process crude from the Cauvery basin. With the commissioning of the mini-refinery on June 22, crude from the Cauvery basin need not be transported by wagons to Madras.

The basin crude is currently being processed at the Madras Refineries unit at Manali near Madras. The mini-refinery would have a product mix of kerosene, diesel and naphtha. It has been integrated with a liquified petroleum gas (LPG) separation plant to process 180,000 cubic metres of associated gas into 15,000 tonnes of LPG every day. Its annual capacity could be stepped up to three million tonnes, once the crude availability from the basin is increased.

CRL plans Rs. 481 crore expansion

The Central Public Sector Cochin Refineries Ltd. (CRL), has drawn up a 15-year expansion, diversification and modernisation programme based on its Seventh Plan achievements, according to CRL Chairman and Managing Director, **Mr. K.L. Kumar.**

Under the programme, CRL's refining capacity would undergo a third stage expansion costing Rs. 481 crore. This would raise its capacity to 7.5 million tonnes from the existing 4.5 million tonnes by March 1995, he said. Commissioned in 1966 with technical collaboration and financial participation of the Phillips Petroleum Company, US with an initial refining capacity of 2.5 million tonnes per annum (mtpa), its capacity was raised to 3.3 mtpa in 1973 and to 4.5 mtpa in November 1984.

He said the capacity expansion was being undertaken in view of the country's growing consumption of petroleum products. He said the expansion programme would involve a foreign exchange component of Rs. 25 crore for the import of special equipment to keep up with the technological upgradation of the refining process.

Mr. Kumar said the CRL, which had an authorised capital of Rs. 75 crore, had a turnover of Rs. 1,478.60 crore during 1991-92 as against Rs. 1,488.64 crore achieved during the previous year, attaining a capacity utilisation of 107.5 per cent and 111.24 per cent respectively.

All time high production in 1990-91

He said the all-time record performance during 1990-91 was attributed to CRL's uninterrupted working with no shut down for maintenance that year. He said the CRL earned a record profit of Rs. 97.95 crore during 1991-92 as against Rs. 96.84 crore earned during the previous year as against just Rs. 4.65 crore during 1986-87. The crude intake during 1990-91 was also a record five million tonnes. It was 4.8 million tonnes last year. The crude comprised 3.5 million tonnes of Bombay High and one million tonne of imported Arab mix, he said.

Mr. Kumar said production of aviation turbine fuel, superior kerosene oil, high speed diesel and light diesel oil accounted for 56.47 per cent of the crude intake of the refineries. He said the fuel and crude loss in refining process at CRL was estimated at 6.76 per cent, totalling roughly 304,000 tonnes from its annual consumption of 4.5 million tonnes of crude. He said diesel accounted for the largest share among the CRL's products with 18.29 lakh tonnes followed by kerosene (6.66 lakh tonnes), petrol (300,000 tonnes) and liquefied petroleum gas occupying the fourth place with 143,000 tonnes during 1991-92.

First stage clearance for increasing benzene capacity

Mr. Kumar said as part of the CRL's capacity expansion, it had been given the first stage clearance by the Centre for raising its benzene production capacity to 210,000 tonnes per annum from the existing 87,200 tonnes, involving a capital outlay of Rs. 327 crore. The project would be commissioned by 1997-98. The stage one approval involving a sanction of Rs. 9 crore had been guaranteed for finalisation of the project report, he added. He said the CRL had spent Rs. 12 crore for technology upgradation with the computerisation of the refining process in 1989.

It was the first to achieve this distinction in the country. The refinery had offered to provide a Rs. 55.56 crore loan assistance to the Cochin Port for taking up the channel deepening work to enable larger oil tankers to call at the port. The amount would be adjusted against future wharfage to be paid by the refineries, he added.

Safety awards

On the unit's performance, he said CRL has bagged a number of awards for productivity, safety, energy conservation and pollution control measures since 1988. He said noteworthy among them were the international safety awards, the latest being from the National Safety Council, US for 1990-91.

He said the refineries had also bagged the London-based British Safety Council Award consecutively for three years from 1988-89. He said the Kerala chapter of the National Safety Council had also selected CRL for its 1990-91 industrial safety award. He said CRL had won the Kerala Pollution Control Board's awards for three consecutive years from 1989-90. He said for energy conservation, CRL had received the Jawaharlal Nehru Centenary Award during 1988-89. It has also won the Kerala State Productivity Council award for 1988-89.

BECHTEL KEEN ON TIE-UPS

The Bechtel group has expressed its interest in setting up facilities in the power sector, infrastructure, petrochemicals, gas and oil. Stating this at a meeting with the Associated Chambers of Commerce and Industry (ASSOCHEM) recently, the group's vice president, **Mr. J.K. Elliot** said the group was keen on collaborating with local firms in India, in exporting materials and in providing technical and other personnel to their firms in South-East Asia.

He emphasised the need for an improvement in the overall climate for direct foreign investment and technology transfer. He added that his company, so far involved only in the setting up of an automatic energy plant, would now set about in tieing up with various companies in India. The group added that it would strive to make its contribution towards the accomplishment of ambitious projects in India which require specialised expertise backed by adequate resources to which Bechtel had an access in the international market.

Caprolactum producers hit by cheap imports

Import liberalisation has put two public sector giants manufacturing caprolactum, an essential raw material for synthetic fibres, in the thick of recession. GSFC, which is the larger of the two, has an excess inventory build-up of one-and-a-half months, while FACT is in a worse situation, with an excess stock of 800 tonnes.

FACT had shut its caprolactum unit for three months and the production was resumed in May. Following the reduction in custom duty on import of caprolactum, synthetic fibre manufacturers started importing it in a big way through LERMS. The Modis, for instance, are importing 70 per cent of caprolactum while earlier they were buying 80 per cent of it from FACT and GSFC. Shriram Fibres have also increased their import by 25 per cent.

According to industry sources, leading 20 manufacturers of synthetic yarn and fibres have resorted to import of caprolactum, resulting in a glut in GSFC and FACT. Fibre manufacturers have reason for imports. GSFC, which was a monopoly supplier till recently, increased the caprolactum price by 50 per cent in the last 10 months. When FACT started manufacturing caprolactum eight months ago, it priced the product higher, by about Rs. 5,000 per tonne. The price difference with the imported caprolactum was Rs. 10,000 per tonne.

The landed cost of imported caprolactum is Rs. 35,000 per tonne. An addition of 50 per cent import duty and 17.25 per cent countervailing duty takes the final cost up to Rs. 79,000 per tonne. The manufactured price of domestic caprolactum is Rs. 73,000 per tonne on which there is a excise and sales tax of 21.25 per cent. The price, thus, works out to Rs. 89,000. GSFC Managing Director, **Mr. P. Basu** said: "While benzene prices were raised, import duty was brought down, thus making the domestic product more expensive than the imported one". A severe recession in the international market has further added to GSFC's woes. Global prices have fallen from $1,450 to $1,200 per tonne, making import further cheap and exports uncompetitive. The plight of FACT is worse. Its cost of production is extremely high because huge capital investments went into its new plant, which witnessed several fold cost overruns.

Both FACT and GSFC have, as a result of this, shelved their expansion plans. Meanwhile the synthetic fibre manufacturers, who were making loss a couple of months back, are back on the rails after import liberalisation. Modipon, for instance, was losing Rs. 1 crore per month till March this year. Now it has been making a modest profit of Rs. 30 lakh per month.

Mr. Y.K. Modi of Modipon says: "GSFC made profit at our cost. It has been increasing the price of caprolactum arbitrarily". GSFC and FACT have now no other option than to reduce their prices. Only the smaller fibre manufacturers, who can't afford to open a letter of credit continue to buy in bulk from them. The two giants have, therefore, decided to fight the situation together and the formation of an unofficial cartel may be the obvious outcome.

VIP INDUSTRIES TO MAKE MOULDS IN NASHIK

VIP Industries Ltd., is setting up a highly advanced plastic mould plant in Nashik at an approximate cost of Rs. 20 crore. The company has tied up with Tooling Products Ltd., a British company of international repute, for technological knowhow to manufacture sophisticated moulds. Speaking to *Financial Express*, **Mr. Piramal,** who has also decided to shift his base from India, said the plant will manufactur[e] moulds using CAD/CAM technology. The actual implementation of the pro[ject] will start in the next two to thre[e] months. The company already has [a] sophisticated tool room where actua[l] R&D work is undertaken.

The mould plant will also source th[e] existing operations of VIP since it use[s] substantial moulds. Yet another plan i[s] to set up a Rs. 15 crore luggage manufacturing plant at Sinhar which will b[e] entirely dedicated to exports, though no[t] an EOU. The actual implementation wil[l] take some time. VIP already has thre[e] plants each at Jalgaon, Nagpur an[d] Nashik, which also currently caters to the export market. It becomes difficul[t] to service domestic and exports marke[t] simultaneously from the same plants, h[e] feels. In 1991-92 his company exporte[d] Rs. 6 crore worth luggage and this yea[r] it is expected to double the performance. He plans to double his export every year. Mr Piramal is very cautious to spell out concrete future plans of his global expansion. Inmediately he has identified Indonesia and Nigeria as two countries where he can set up plants and later expand. He envisages to invest at least Rs. 15 crore in setting up a plant in Indonesia, which can be expanded later. The initial thrust of his export market will be the Middle East and Europe. By 1994 Mr. Piramal expects to make an entry into the American market to establish his product.

SHRIRAM GROUP TO SET UP AEROSOL VALVE PROJECT

The Shriram group, a major player in the chit fund and truck financing business is setting up a sophisticated aerosol valve project — Pavron Spraytech — at Jalahalli in Bangalore at a cost of Rs. 1 one crore. These valves are import substitutes and will find applications in a variety of atomisers. The company, which is expected to go on stream in October this year, has entered into a technical collaboration with an American firm, Emson Research Inc.

Technical collaboration for Assam cracker being tied-up

The Thapar group has approached multinationals such as the US conglomerate **Mr. M.W. Kellog,** the German Linde AG, Union Carbide, Dow Chemicals and the US-based Brown, Root & Brown for technical collaboration for its Rs. 3,000 crore Assam gas cracker project. Other companies that the Thapars are approaching for their polypropylene unit in Assam are Stamicarbon from the Netherlands, AMOCO, the American Oil Company and BASF, Germany.

The Thapar top brass, however, feel that some of the multinationals are evincing little interest because of the general impression that Indian projects have, despite the liberalisation proposals, fizzled out at the initial stages. In addition, the setting up and commissioning of projects is also subjected to delays. This feeling has partly been fuelled by the Du Pont-Thapar project that has dragged endlessly seeing a change through four governments, among others say industry observers. Of the companies the group has approached for technology, Stone and Webster and Lummus have been evincing more interest.

Lummus has a tie-up with IPCL along with Haldia Petrochem. The Maharashtra Gas Cracker has also tied up with Stone and Webster Engineering Corporation for the same product. In addition, the foreign company has collaborations with GAIL at Auriya as also with Reliance Petrochemicals Ltd. (RPL). For the LLDPE and HDPE units, both with a one lakh tpa capacity, the group is yet to hold discussions. Reliance has a tie-up with Du Pont, Canada, BP Chemicals, a UK-based company, has tied up for technical collaboration with Polyolefins, IPCL Baroda and the Maharashtra Gas Cracker for LLDPE and HDPE and Mitsui, Japan with whom Haldi Petrochem has a tie-up. For its polyprolylene unit which has a capacity of 51,000 tonnes per annum for merchant sale, the company has been talking to Himont of Italy, which already has a tie-up with IPCL Baroda, MGCC and Haldia Petrochemicals.

Solvay & Cie, the Belgian company, has a tie-up with the Kosi Kalan-based Polypropylene India Ltd., a Kanoria unit. RPL has a tie-up with the German company BASF for its polypropylene unit. The Thapar technical team is keen for a tie-up with Union Carbide as it is perceived to have a good technology.

The transnational may not want to enter into any agreement of any sort with the Indian companies after the Bhopal gas episode for which it has had to pay heavily in terms of money and image. Meanwhile the Thapar group is hesitating to sign the final Memorandum of Understandings (MoU) with the Assam government before the state government acquiesces to all the tax concessions that it has asked for.

PLEA TO REDUCE DUTY ON PLASTIC RAW MATERIALS

The All India Plastic Industries Association (AIPIA) has urged the government to reduce customs duty by at least 25 per cent on the plastic raw materials which are lying uncleared at the ports and are in the pipeline.

A delegation of the AIPIA led by its president, **Mr. R.N. Gupta,** called on the Finance Minister and explained to him how the 1992-93 budget proposals had "adversely" affected the plastic industry as the prices of raw material had gone up by more than 30 per cent. The delegation suggested to the Minister that there should be common rate of customs and excise duty on all homogenous plastic raw materials as well as inputs.

Rs. 500 crore leather complex for Bengal

The West Bengal Government will shortly set up a leather complex, involving a cost of around Rs. 500 crore under the financial assistance from the United Nations Development Programme (UNDP) on a 250 to 300 acre land at Bantala-Ghatakpukur area in South 24 Parganas. The project will have about 100 units to produce footwear, footwear uppers, leather goods and garments for meeting the export and domestic demands.

An UNDP team which had already visited the spot will soon present its report about the possibilities of such a complex with the Small-Scale Industries Departments of the State Governments. This apart, facilities for leather finishing (meeting about 20 per cent of the finished leather required for the different units in the leather complex itself), computer-aided design centres, modern training centres for the upgradation of technology are also being provided in the leather complex.

The proposed complex will go a long way in inspiring confidence among the international buyers to programme their purchases under ideal conditions of quality standards, besides generating employment and attracting local entrepreneurs to set up units in these areas.

Addressing members of the Calcutta Chamber of Commerce in Calcutta on June 15 **Mr. Bidyut Ganguly,** State Minister of Commerce and Industry, said apart from the development of a large leather complex the State Government is also planning to invest substantially in the development of fishery projects.

Mr. Ganguly was confident that with the setting up of the polyester filament yarn project at Barjora in the Bankura district, substantial employment will be generated. Said he: "This project will have the best downstream facilities and could easily be compared to the downstream provision of the Haldia Petrochemical Complex". He said that plans for the Haldia Petrochemical Complex have already been worked out and the second report will soon be presented on the infrastructural facilities required for this project.

"Nothing can stop us from setting up the project. With the paltry financial strength that we have, we are confident of going ahead with the complex". He however, declined to comment on time period required to complete the project.

Mr. S.N. Menon, Managing Director of West Bengal Industrial Development Corporation (WBIDC), who also addressed the meeting, said that the state expected to see about 20 to 25 units coming up in about five months.

WBIDC was currently "escorting" these units which involved an investment of about Rs. 2,500 crores. The investors had sent in proposals for setting up steel, sponge iron and pig iron projects. "WBIDC has decided to provide all the infrastructural assistance and ensure that the projects go on stream as scheduled", Mr. Menon said.

CONCERN IN GERMANY OVER PCP IN LEATHER ACUTE

The hue and cry by the German media highlighting the carcinogenic properties of pentachlorophenol (PCP), a chemical used for tanning leather can have serious repercussions on the leather trade unless Indian exporters ensure strict quality control.

While the chemical is totally banned in Switzerland and Austria, the official limit for PCP content in Germany is five mg per kg of leather. In Europe, the limit is 1,000 mg. PCP, which is listed as a carcinogenic, is used as a preservative in leather as it protects leather skins from decaying.

Several articles in the German press have led to feelings running high among consumers. Recently, a popular German consumer magazine published an article on the use of PCP.

The magazine bought leather articles, ranging from jackets to purses, from large departmental stores and had them tested for PCP.

The results, however, could not be regarded as positive. Of the 20 smaller articles and the 18 pieces of clothing, it was found that 10 were over the permitted German limit of five mg per kg although all items lay under the European limit of 1,000 mg per kg.

Reports like these have provoked many heated debates in the industry and have made the consumers more sensitive to the issue. But retailers and those who have leather to offer, regard the issue as having been blown out of all proportion by the media.

However, the sources said, the fact is that more and more consumers are now requesting a guarantee to the effect that the leather, which they wish to purchase is in no way harmful. And for the retailers, the problem is that leather is almost exclusively imported, so it's hard to convince consumers.

According to sources, contrary to latest reports in the German media, the Indian leather industry has been able to overcome the PCP crisis to a large extent. Recent laboratory tests in south and central India, home of over 60 per cent of the tanneries, have indicated that most of the leather is either completely PCP-free or within the permissible limit of the five mg per kg.

The same applies for most of the reputed tanneries in the country's north and eastern regions. The sources also described Indian government's intervention in the matter as timely. A notification issued by the Ministry of Agriculture in June 1991, totally banned the use of PCP in the country.

CIL's accumulated inventory rises

Coal India Ltd.'s attempts to improve its cash flow by introducing the 'cash-and-carry' system seems to have boomeranged going by reports in *The Business & Political Observer*. Under the scheme, the company has received offers to lift only four to five million tonnes of pithead stocks until the beginning of May.

The accumulated inventories, on the contrary, have risen to 45.4 million tonnes during the period, up nearly 10 million tonne from the levels in the corresponding period of last year. The company had recently launched a special drive to liquidate 20 million tonnes of pithead stocks which have been accumulating over the last few years. These measures were aimed specially to relieve the shortages felt by the non-core sector industries.

In view of the stoppage of budgetary support to Coal India, the cash and carry system was to be a step toward a better cash position. The better liquidity position expected was to enable the company to invest in new mines, coal processing plants and other quality improvement measures. But this hope has so far been belied.

Coal India has also higher stocks, according to Coal Ministry officials, because it has not been supplying coal to some customers like National Thermal Power Corporation (NTPC). The company had problems with NTPC whose coal stocks were dangerously low about 10 days back because it had not received payments due to it from the state electricity boards.

At the beginning of last month, Eastern Coal Fields had pithead stocks of 6,452 million tonne. Bharat Coking Coal Ltd., had 13.093 million tonne, Central Coalfields Ltd., had 7.44 million tonne and Northern Coalfields Ltd., had 2.04 million tonnes. The pithead stocks lying with Western Coalfields Ltd., were 2.001 million tonnes, South Eastern Coalfields had 5.942 million tonnes. Mahanadi Coal Fields Ltd. had 3.988 million tonnes and North-Eastern Coalfields had 0.14 million tonnes.

Coal India had categorised the pithead stocks into three: stocks lying in collieries within three km of railways siding; pithead stock in collieries which are captive to consumer points like thermal power stations' stocks in collieries which are linked only by roads.

Under the scheme, the stocks are transported to special coal dumps with the stocks being offered for sale without restrictions. However, priority was to be given to special consumers like manufacturers of cement, paper, textiles, glass, lime, brick kilns and the other small industries. The sale price will be fixed as per sampling and testing done by representatives of the Coal Controller and Coal India Ltd. The price also includes the cost of processing and transport.

NEW LICENCES FOR ACQUISITION OF OIL TANKERS STOPPED

The Shipping Acquisition Licensing Committee (SALC) of the Ministry of Surface Transport has decided not to give licences for acquisition of oil tankers. The Reliance group, Essar Shipping Limited, Century Shipping had applied for permission to acquire oil tankers.

These companies are reported to have stated in their application that oil tankers would be offered to the Oil Coordination Committee (OCC) for the country's oil transportation requirement.

The OCC representatives are said to have told the SALC, in its meeting held at New Delhi recently, that since Essar group has already been given permission to acquire two oil tankers it did not require any more tankers for the time being.

ONGC signs MoU with pruned targets

The government has scaled down the targeted production by the Oil and Natural Gas Commission by more than seven million tonnes for 1992-93. The memorandum of understanding (MoU) signed by the Commisssion and the Petroleum Ministry has slashed the targeted production to 25.54 million tonnes from the 32.91 million tonnes for 1991-92.

The metreage expected to be drilled during the current year has also been placed marginally. However, the targets for LPG and gas production have been placed marginally higher than last year's. As far as the financial parameters are concerned, ONGC is expected to achieve a gross profit to capital employed ratio of nine per cent.

Comparative figures for 1991-92 for financial parameters are not available since no MoU was signed between the ONGC and the Petroleum Ministry for last year. Of the total expected reduction in production, 7 million tonnes is accounted for by a decline in production from Bombay High.

The reason stated in the MoU is that most producing fields, including Bombay High and the fields in North Gujarat, have entered the natural decline phase. The possibility of a decline in production has also been attributed in the MoU to the delays in granting approvals by the government. For instance, the target of drilling metreage has been reduced because the government is yet to approve the Neelam project in the Bombay offshore.

Besides, some of the newer fields are expected to pose problems of recovery. The scope for increasing production from these fields, according to the MoU, depends on the implementation of enhanced oil recovery schemes. In a bid to remove the bottlenecks faced by the ONGC in increasing production, the government has agreed to clear all foreign exchange proposals within 30 days of submission. The Gandhar development phase-II project, which was to have been clared in September 1989, was only cleared in early May this year.

Projects like the expansion of the Hazira complex and ICP Heera Trunk pipeline project, which were to have been cleared last year, have still not been approved. In the case of new investment proposals, the government has undertaken to accord first stage clearance within four weeks of the submission of proposals while investments will be approved within 16 weeks of submission.

Apart from this, the government has also agreed to consider the enhanced delegation of powers to the Commission. This includes a proposal to increase the powers to sanction and incur expenditures to the extent of Rs. 250 crore for additional and new investment proposals and for replacement and renewal of assets. At present, the ONGC can sanction and incur expenditure of only Rs. 50 crore.

The government has also promised to help ONGC recover dues from public sector undertakings and state governments by adjusting the payments due to them from the Centre. The MoU also states that the government will consider reimbursement of losses on foreign borrowings due to exchange rate fluctuations, the loss incurred because of delays in reimbursing cess payments to state governments, and the extra expenditure incurred by the commission because of price preference to domestic producers.

ONGC NOT TO WIND UP OPERATIONS IN NAGALAND

The Nagaland government has refuted reports appeared in a section of the press that the Oil and Natural Gas Commission (ONGC) was contemplating to shift its office from Dimapur to Jorhat and wind up its operations in the state. Geology and Mining Department Secretary **Mr. Toshi Aier** said that [...] Deputy General Manager in charge [...] the ONGC's operations in Nagala[...] described this news as "baseless a[...] malicious". The state government h[...] assured the ONGC of all possible ass[...]tance and cooperation to ensure that [...] activities were carried on as per sch[...]dule.

It was also decided that a nodal offi[...]cer from the Directorate of Geology an[...] Mining would be appointed for effec[...]ing better co-ordination between t[...] ONGC and the state government. O[...] evolving a common policy for the fix[...]tion of land compensation rates, a high[...] level meeting between the state gov[...]ernment and the ONGC officia[...] decided that the land revenue secretar[...] would shortly take up the matter wit[...] thd district commissioners and the addi[...]tional district commissioners. Regard[...]ing land acquisition for the ONGC'[...] complex at Padumpokhri, it was decide[...] that the secretary would direct the addi[...]tional deptuy commissioner to resolv[...] the impasse.

COAL SHORTAGE HITS UP POWER GENERATION

The short supply of coal is the mai[...] reason for the falling power generatio[...] in the state, according to Uttar Pradesh[...] Minister of State for Power **Mr. Rav[...] Kant.** The Obra Power Plant was get[...]ting 4,998 tonne of coal against a[...] allotment of 7,320 tonne. Similarly[...] Anpara plant was being given only[...] 3,351 tonne against an allotment of[...] 3,840 tonne.

This was also the case in other plants, including Pariccha, Harduaganj and Panaki. He alleged that even the quality of coal supplied was substandard. Despite repeated requests, the Centre was not helping the state, he said. While the demand in the state was 95 to 100 million units per day, the supply was between 85 and 90 million units. To meet the shortfall, the government had prepared some short-term schemes.

L&T, Samsung bag ONGC contracts

The Oil and Natural Gas Commission (ONGC) has awarded contracts for construction of well platforms for the LIII (layer three) field at the Bombay High to Larsen & Toubro, and Samsung of Korea. In the Rs. 2,300 crores LIII development project, L&T has bagged the orders to construct four well platforms (I-M,N,T,W) and Samsung for another four (I-P,Q,S,U).

The LIII development programme is divided into eight sections, of which contracts for seven have already been awarded: Construction of SHG process platforms for which conditional letter of intent has already been offered to a consortium of Daewoo Shipbuilding & Heavy Machineries, Korea and NPCC of Singapore, the SHG gas compressors and other facilities will be supplied by KHI and CR of Japan, whereas the SHG line pipe will be supplied by PJPV — HPL consortium and Soconord-OCTG consortium of Belgium, project of coating and wrapping of the pipelines has been offered to PSL Pipe Coaters. ONGC is yet to finalise the contract for SHW projects for LIII, which have been scheduled for mid 1993.

The LIII oilfield is projected to yield a total of 40 million tonnes of crude oil and 18 billion cubic metres of natural gas under the current investment programme over a 10-year period. ONGC expects to produce 3.53 million tonnes crude oil annually and 5.15 million cubic metres per day.

ONGC has also awarded contracts for construction of well platforms, (N,Q,P) and (L-A,B,C,D,E) for the LII oilfield to Hyundai Heavy Industries of Korea. The commission is yet to award contracts for carrying out modifications in the Bombay High platform.

The LII oil field, which is being developed at a cost of Rs. 1,100 crores, is projected to yield a total of 26 million tonnes of crude oil and eight billion cubic metres of gas. ONGC plans to produce 1.84 million tonnes of oil annually and three million cubic metres of gas per day from LII. Production is expected to begin from 1994-95. Depending upon the reserves available in these two layers, ONGC will finalise proposals for another round of investment at a later stage for both the oil fields.

TALCHER MINES SEALED AFTER DEVASTATING FIRE

Mines of the Nandira colliery in the newly-formed Mahanadi Coalfields in Talcher, Orissa, have been sealed following a devastating fire on June 7.

Coal Ministry sources say the fire might have been caused by a short-circuit in the loader while it was cutting and loading coal underground. The sources said although no lives were lost, coal worth Rs. 10 crores has been estimated to have been destroyed.

The fire is believed to have quickly engulfed other areas of the coalfield, the sources added. The colliery producing 1,000 tonnes of 'B' grade coal per day is now filled with poisonous gases such as methane, carbon dioxide and carbon-monoxide and it has been sealed to stop the flow of oxygen to prevent combustion.

The authorities hope that the accumulating water will now help in extinguishing the fire. In this context, the sources pointed out that the number of serious injuries in Coal India subsidiaries was 476 in 1991 with 137 in Bharat Coking Coal Ltd. alone.

However, this was lower than the 547 cases reported in 1990. Fatal injuries have also gone down from 134 in 1990 to 114 in 1991. To improve mine safety, the Directorate General of Mines & Safety, which oversees the overall safety situation in the mines, is also working on improving the roof bolt system for more reliable mining.

POWER PROJECTS:

$6.8 billion investment proposals received

A two-week whirlwind foreign tour by a high-level governmental team looking for private foreign investments for the Indian power sector has notched up fresh "commitments" and proposals from foreign companies worth an impressive $6.8 billion. This is over and above the commitments received before the team took off on the tour of U.K., USA and Singapore on May 25.

If all the investment proposals put up till date by Indian and foreign companies come up, there would be a massive private generation of 16,900 MW of electricity.

Surprisingly, the team headed by Cabinet Secretary, **Mr. Naresh Chandra,** and including Finance Secretary, **Mr. K.P. Geetakrishnan,** and Power Secretary, **Mr. S. Rajagopal,** seems to have received an enthusiastic response without having to concede much in return. The Indian government held firm on its refusal to provide sovereign guarantees on foreign loans to be pumped into the Indian private sector.

It was also made clear that risks with respect to foreign exchange fluctuations will not be provided, when it comes to repatriation of dividends. The delegation also conceded little on what has been termed by foreign investors as the biggest hindrance in investing in the Indian power sector — non-payment of dues by the State Electricity Boards (SEBs).

The assurance from the Indian side was that irrevocable letters of credit will be opened by the SEBs so that the generation companies' dues are guaranteed. Further, a tripartite arrangement is possible between the SEBs, their banks and the generation companies to open an "Escrow" account in which the private companies will have first charge.

Briefing pressmen at New Delhi on June 10, Mr. Naresh Chandra made it clear, "we did not sing a swan song to attract them here. We told them what the situation on the ground was." This point was also emphasised by Mr. Geetakrishnan. The foreign secretary said that if the sovereign guarantees could be provided, then the government would have mobilised the funds on its own, and set up the additional power capacity in the public sector.

Fiscal correction and sovereign guarantees for private foreign loans cannot go hand in hand, he clarified. The new two-part tariff system, a 16 per cent return on net worth, exchange risk guarantees on foreign loans are all part of a package to attract additional resources in the power sector. Mr. Rajagopal disclosed that the World Bank, the International Finance Corporation (IFC) and the Union Ministry of Power have decided to put into place a task force that will step up private investments in India. "They will take one or two states as models and take up pioneering projects in them," he said.

The power secretary said that the response was enthusiastic. Besides the World Bank and the IFC, some of the biggest investment firms in the world has shown keen interest in the Indian power sector. Some of the firms have even circulated confidential notes on investment prospects in the Indian power sector to their clientele. "Some of their teams are landing in Delhi shortly." Work on some of the projects may even get going by the end of the year, he said.

Mr. Rajagopal said that he was not averse to import of liquid nitrogen gas in special containers or even import of coal, now that it is under open general licence, for setting up power projects in the country. Mr. Rajagopal admitted that one letter of intent signed by one of the biggest names in the U.S. electricity business — Southern Electrical — with the Orissa government has expired. But he said that the company has no intention of backing out, and a decision will be taken by the multinational in the next few months to set up an independent power company in India.

But all team members sounded a note of caution on the volume of investment that will finally come in from abroad. "There will be slippages," warned Mr. Rajagopal. "They (foreign investors) do not have any illusions about how things are in India; we have told them the situation will be challenging," claimed the Cabinet secretary.

"We provided authoritative clarifications. We do not have the resources to satisfy our entire power needs. Indian private sector investments alone would not have sufficed," explained Mr. Chandra.

He went on to add that inviting foreign participation in the infrastructure sectors has become necessary in an increasingly interactive world. Efficiency levels are bound to improve, especially in the power sector, when best names in the world compete to set up projects in the country, summed up the Cabinet secretary.

FOUNDATION STONE FOR ASSAM REFINERY NEXT MONTH

The Prime Minister, **Mr. P.V. Narasimha Rao,** will lay the foundation stone for the Rs. 1,830 crores oil refinery in upper Assam early next month. Giving this information on June 8, the Assam Chief Minister, **Mr. Hiteshwar Saikia,** said the Centre has cleared the memorandum of understanding (MoU) for the refinery being set up at Numaligarh in Golaghat district. Being set up in the joint sector by the state government and the Indo-Burma Petroleum Company, the refinery, the third in the state, would have an annual refining capacity of three million tonnes.

Total ban proposed on mining in HP district

An expert committee constituted by the Himachal Pradesh High Court to study the impact of mining of limestone and gypsum in Sirmur district of the state has recommended complete ban on the entire mining operation in the area which it feels, was posing a serious threat to environment and ecological balance.

The committee comprising forest, mining and environment experts has submitted its report to the high court for follow-up action in the case. The order for setting up of the committee were passed by the high court in January last on a writ petition filed by one Kinkari Devi in 1987 alleging that the mining operation had caused a severe damage to her agricultural land and had demanded compensation and immediate ban on the mining operations in the area.

The experts committee visited the mining areas and closely studied the impact of mining on surrounding agricultural land and the environment. The committee observed that the impact of unplanned, unsystematic and unscientific mining in the region had led to serious ecological repercussions.

The combined effects of these factors were quite disastrous, they observed. The open-cast quarrying by itself disturbs the land surface as it involves excavation not only of the desired minerals but also of the overburden and waste.

The removal of the top soil, denudation of forests, disposal of mineral waste and methods of quarrying have the inevitable consequences of extensive land-slides, run off and soil erosion. The other forms of ecological degradation include air, water and noise pollution. Identifying the effected areas, the committee of experts said these areas are giving desolate look with practically no trees existing in the leased areas and around.

MINING INDUSTRIES IN GUJARAT MAY GRIND TO A HALT

Mining industries in Gujarat may come to a standstill because of the notification issued in January by the Department of Environment and Forest banning mining operations and industries alike within 25 km of national park, the game sanctuary and reserve forest areas.

According to the report by the Minerals and Mines Department of the state government, most of the existing and proposed mines and industries fall within the restricted areas.

The state government had asked the mines and minerals department to assess the effect of the notification on the mining industries in the state.

The Centre's notification would result in halting development, huge loss and unemployment due to the closure of various mineral-based industries in the state, the report pointed out.

The Mines and Minerals Department report stated that forest and natural resources generally occur together, and minerals, a depleting asset and the backbone of industrial production, occurs only within certain geological parameters and, therefore, cannot be extracted from any other area.

The report stated that the hue and cry raised over the danger to forest by mining activities was not true, as less than one per cent of the total forest land in the state was under mining activity.

At least 350 lease-holders would be affected due to notification and the state would lose about Rs. 150 crores of revenue every year, including Rs. 25 crores royalty from Minerals and Mines Department, and Rs. 125 crores of sales tax, sources said.

CABINET CLEARS NEW ROLE FOR DGTD

The Director General of Technical Development (DGTD) is being revamped and given a new role in view of the liberalisation of the economy. Uncertainty on the continuation of DGTD existed for a long period until a recent cabinet decision okayed the new role of the Directorate.

With the system of industrial licences rendered unnecessary, except in some cases, the Directorate has now been entrusted with promotional activities which includes compiling of information, disseminate information of the latest available technology and organise country-wide technical seminars. However, the director will continue to monitor all such cases where industrial licence is necessary.

The Cabinet meeting also suggested 20 per cent cut in Government grants to DGTD. Already 176 staff members of the total strength of 861 has been rendered surplus. As a measure of further reduction at least 20 per cent of the post at each level will be reduced.

Immediately, the Directorate has changed the technical development division to an industrial data division which will collect information on a single item extensively.

As a result of the change the Directorate has identified 50 to 60 items on which it will collect extensive data from international institutions. However, for the present the Directorate does not have any plans to sell its information on a commercial basis.

Hike in metal production envisaged

An impressive growth in employment generation in the mining and quarrying sector as well as a quantum jump in the production of metals, achieving near self-sufficiency in lead and aluminium, have been envisaged in the Eighth Five Year Plan.

The country is set to become self-sufficient in lead soon with production expected to reach 78,000 tonnes and the demand estimated at 82,000 tonnes this year. But the shortfall is expressed to be wiped out next year with commissioning of the new project.

However, as consumption of the metal is estimated at one lakh tonnes by 1997, there might be a shortfall with the production targetted at 96,000 tonnes at the end of the plan period. But that would drastically reduce the imports down to only four thousand tonnes from the current 26,000 tonnes, the plan document on mines said.

In aluminium production, the country turning out a surplus, is exporting 68,000 tonnes of metal at present as production touched 521,000 tonnes. But with demands increasing imports are to go up four-fold from the present level of 4,000 tonnes, because domestic consumption is likely to touch 672,000 tonnes from the present 457,000 tonnes.

Production of the metal has been targetted at 656,000 tonnes by the end of the plan period. In zinc, consumption though abnormally low at the present 136,000 tonnes, is estimated to rise from the present 110,000 tonnes to 180,000 tonnes by 1997, needing import of 26,000 tonnes.

The per capita consumption of zinc domestically is the lowest in the world at 138 gms against the US with 3.67 kgs. But the demand for zinc is estimated to grow at four per cent during the Eighth Plan. Production of zinc (primary metal) has been projected a 154,000 tonnes at the end of the pla with an increase of 34,000 tonnes fron the present level. As far as copper i concerned, dependence on import would continue with the production pro jected at 53,000 tonnes from the presen 43,000 tonnes.

With the domestic demand expected to reach 200,000 tonnes by the end of the plan period, compared to the present 150,000 tonnes, import of refined metal, including non-canalised item might increase to 145,000 tonnes against 107,000 tonnes at present. The domestic demand, growing at the rate of six per cent against the world rate of three per cent, the country's demand has been projected at about three lakh by the turn of the century.

In iron and steel, India, ranking 11th in steel production, plans to increase export of iron ore to 36 million tonnes by the end of 1997, with production of iron ores expected to touch 72 million tonnes from the present 56.50 million tonnes. Domestic consumption of iron ore is estimated to rise to 36 million tonnes from the present level of 21.50 tonnes.

As regards finished steel, production from the main steel plants and mini steel plants has been envisaged at 20.90 million tonnes against the present 14.60 million tonnes. Import (canalised) of steel is to register a rise by 50 per cent from the present one million tonnes as the domestic demand of finished steel is to go up to 21 million tonnes at the end of the plan period from the present 15.30 million tonnes.

The government, expecting an increase in production in the private sector after the decontrol of steel, has decided not to set up any new steel plant in the public sector in the Eighth Plan. Production of finished steel last year registered a 5 per cent increase over the previous year with a production of 14.2 million tonnes, despite the fall in the secondary sector's production.

IISCO REHABILITATION

Six-man panel to evaluate bids

The government has constituted a committee of six experts to evaluate the rehabilitation and modernisation bids for the Indian Iron and Steel Company Limited (IISCO). The committee has been formed to impart transparency in the government's decision to revive IISCO under joint sector venture.

Mr. T.L. Shankar, Director of Institute of Public Enterprises, Hyderabad is the Chairman of the Committee. The other members are **Mr. V.S. Jhafa,** former Secretary and Chairman of Bureau of Industrial Cost and Prices, **Mr. P.R. Khanna,** a leading chartered accountant and **Mr. K.C. Khanna,** former Chairman of Steel Authority of India Limited (SAIL). **Mr. Jagdish Khattar,** joint Secretary in the Ministry of Steel, will be the convenor of the committee.

Mr. Shankar is considered to be an authority on public enterprises. The Andhra Pradesh government had sought his expertise in over-seeing the privatisation of Allwyn Nissan Limited. The committee has been asked to obtain and evaluate the offers and negotiate with the parties shortlisted by the SBI Capital Market Ltd. It will also make suitable recommendations on financial restructuring of IISCO, if found necessary. The committee has been given a free hand to invite experts from different fields to assist them in their deliberations. SBI Capital Market Limited will assist the committee as it has already done the preliminary spadework. The committee is to submit its report by the end of August this year. One of the major guidelines given to the committee is to study viable modernisation programme working on acceptable framework. While identifying the most suitable partner for the joint sector participation with SAIL, it will ensure that the interest of the employees of the company is fully protected. The government has also clarified that there will be no retrenchment and service conditions and seniority of employees will be fully protected.

It is learnt that the Mittal group, Mukand Steel and Lloyds Steel had visited the IISCO plant in Burnpur and had seen mines, collieries and had held detailed discussions with the management of the company. They have now been asked to submit their bids which will be evaluated by the expert committee. SBI Cap is reported to have prepared a detailed bid document which is being circulated to interested parties. After receipt of the bid offer, the committee will open the bid documents and will begin negotiations after evaluation of their proposal.

Mr. Sontosh Mohan Dev, Minister of State for Steel, in a discussion with the trade unions on June 11 had assured them that they would be taken into confidence after the committee had finalised its recommondations on joint sector participation. He said that paucity of resources had forced the government to look for joint venture option.

Trade union leaders, who participated in the meeting, said that **Mr. S.R. Jain,** Chairman of SAIL, told them that SAIL was in no position to carry out the modernisation on its own. He said that earlier the company had decided to carry out the modernisation under its banner based on certain assumptions. Mr. Jain told them that these assumptions went awry in view of the changed scenario.

Mr. Jain told the union leaders that SAIL had expected to generate additional Rs. 6,000 crore on account of decontrol of steel prices. However, the price increase effected last month barely covered the rise in the input cost which had upset all its calculations, he said.

Hindalco plans Rs. 1,100 crore investment

Hindalco Industries Ltd., an Aditya Birla group company, is planning a major expansion cum diverisification programme involving a sum of Rs. 1,100 crore over the next three years. The company plans to go in for a Euro-issue of $110m to part finance the expansion programme.

This was disclosed by **Mr. A. Agarwala,** President, Hindalco industries, to *The Economic Times*, at New Delhi recently. Agarwala also said the application for the Euro-issue has been submitted to the government and is awaiting clearance. Hindalco is setting up an aluminium foil plant at Jagdishpur costing Rs. 150 crore. The land has been acquired and the project is under implementation.

The company is signing an agreement with Pechi of France shortly for transfer of technology. The company is planning to increase the installed capacity of its alumina plant from 1,50,000 tonnes to 2,00,000 tonnes. This expansion is expected to cost around Rs. 600 crores.

Hindalco is also expanding the capacity of its power plant by setting up two more units of 150mw each for Rs. 350 crore. Mr. Agarwala said the company is also exploring the possibilities of setting up a steel plant in Maharashtra. The company plans to go in for a hot briqueted steel mill (rolling mill). But the company is not going in for backward integration in the form of a sponge iron plant, Agarwala added.

All the above projects will be financed through loans, internal accruals and the Euro-issue. The company has at present no plans for a public issue he added. Agarwala had come to sign a contract with **Mr. Kjell Hagen,** Managing Director, ABB-Environmental, Norway and **Mr. Alok Mukherjee,** Managing Director, Flakt India Ltd., for purchase of a dry scrubbing system for Hindalco's aluminium plant at Renukoot. The contract is worth over Rs. 100 crore to ABB-Environmental and Flakt India.

Mr. Agarwala said the company has made a net profit of Rs. 88 crore for the year ended 1991-92, 26 per cent over last year, and sales have gone up by 25 per cent despite the sluggish nature of the aluminium market.

Exports have touched Rs. 50 crore, he added. The contract signing ceremony was attended by **Mr. Jo Gaarder,** Ambassador of Norway a **Mr. Paer Kettis,** Ambassador Sweden among others.

NALCO SIGNS MoU ON EXPORT

The National Aluminium Compan (NALCO) signed a memorandum understanding (MoU) with the Unic Government, aiming at export of 4.2 lakh tonnes of alumina and 65,00 tonnes of metal for the year 1992-9. The new MoU provides for productio of eight lakh tonnes of alumina an 1,95,000 tonnes of aluminium represent ing an increase of 5.26 per cent and 8.3 per cent respectively over the last year's target a NALCO release said.

The NALCO, a Government of Indi enterprise, exported 60,000 tonnes o metal against the target of 45,000 las year and also crossed targets fo 1991-92 in metal production, meta export and power generation. In the nev MoU, signed by **Mr. V. Krishnan,** Sec retary (Mines), Ministry of Mines and **Mr. S.N. Johri,** Chairman-cum Managing Director, NALCO, the weightage factor for financial efficiency has been increased from 25 to 50. The financial efficiency factor would now include evaluation of gross profit and gross margin as percentages of capital employed among other factors.

Study notes erosion of TN industrial base

Tamil Nadu has a long way to go before catching up with Maharashtra and Gujarat in accelerating the pace of industrial development, although it claims to offer an attractive package of incentives on the pattern of the other two states.

According to a critical study done by a leading research institute in Madras and quoted in *The Economic Times*, the dark portends identified in Tamil Nadu's economy are: erosion in industrial base, absence of large projects, low share of institutional finance, and lack of aggressiveness in the role of promotional agencies.

The study, sponsored by an industrial organisation, says that only 37.5 per cent of the investment envisaged in major industries is in the private sector, the remaining being in the joint and public sectors. Given the record of performance of both joint and public sector units, the study says there is nothing very encouraging in the emerging industrial scenario as far as Tamil Nadu is concerned. The study is being hotly debated by members of the organisation, and after forming its opinion on the findings, it proposes to make suitable recommendations to the state government for modifying the package of incentives and unveiling new initiatives to stem the rot. An analysis of the industrial scenario of Tamil Nadu compared with the two other states paints a gloomy picture, the study points out.

While there has been consolidation, and even substantial growth, in certain traditional businesses, there has not been much foray into modern growing industries. Therefore, the industrial base of Tamil Nadu's economy has narrowed. The combination of an inherently dynamic entrepreneurial class, willing to assume risks, and an aggressive state government tuning its promotional activities to facilitate setting up of industries, are necessary to give a boost to industrial activity in Tamil Nadu, the study observes.

It attributes the low-key level of private and public sector industrial activities in the state to two main factors, namely, low share in institutional finance and lack of adequate state promotional activity. In the cumulative assistance provided by all-India financial institutions till March 30, 1990, Andhra Pradesh claimed a share of 8.54 per cent as amount sanctioned and 7.97 per cent as amount disbursed. The relative shares of Tamil Nadu are 9.28% and 9.86%, Gujarat 12.34% and 12.55%, and Maharashtra 19.83% and 19.66%. An analysis of the industry group-wise assistance sanctioned IDBI and IFCI reveal that institutio finance in Tamil Nadu is at a comp atively low level.

This implies that the projects co ceived in the state are by and large bei financed by resources generated fr within or by borrowings elsewhere. T phenomenon to a large extent expla why the average size of the proje coming up in the state are small co pared to Maharashtra. Regarding state's promotional role, the study no that the Gujarat Industrial Developm Corporation (GIDC) and Maharash Industrial Development Corporati (MIDC) have undertaken significa promotional activity. In the develo ment of industrial area, expenditure GIDC up to March 1989 was 284.51 crore, and MIDC Rs. 121. crores, while the State Industrial Pr motion Corporation of Tamil Na (SIPCOT) had spent more Rs. 21. crore as on March 30, 1990. The un under production in GIDC industr area in number 18,821 as agai MIDC's 13107, while SIPCOT's reco is a dismal of 351 units. Again, the to investment made by the functioni units of GIDC amounted to Rs. 2679. crores. MIDC stands at Rs. 4199. crores, while the investment in the un of SIPCOT growth centres comes to mere Rs. 355.43 crores.

Need to adopt ISO 9000 methods urged

Though 90% of Indian companies are not ready for the International Organisation for Standardisation (ISO)-9000 series, which clarifies the relationship between different quality concepts and presents three models for quality assurance systems, its mandatory regulations are slated to come into effect from January 1, 1993. The Bombay Industries Association (BIA), organised an introduction to the coveted stamp of ISO 9000 series recently, to appraise members on the need for its adoption in the Indian market scene.

According to **Mr. B.D. Shetty,** President of BIA, a decision to have a single system of quality standards worldwide was the need of the hour way back in 1979, and with the world shrinking due to the growth of international trade, there was a dire need for global uniformity of standards. On an average, some 35,000 standards and specifications are in use worldwide. Mr. Shetty informed members that in 1987, the ISO published a series of standards. A set of five standards ISO 9000 to ISO 9004 are known as the ISO 9000 series, which clarifies the relationship between different quality concepts. ''If India has to participate in the global market, the acceptance of the ISO series becomes all the more imperative', reiterated Shetty.

Concurring with his view, **Mr. Ravi Chadha,** who had been invited specifically to speak on the subject termed the ISO 9000, as a series of five international standards used to provide a universal framework of quality assurance. Already in use by NATO, the United States Department of Defence and the American National Standards Institute, ISO 9000 has been adopted by 43 countries. By the end of the current year, 20,000 European companies will be registered with the system. Mr. Chadha warned that within the next five years, the ISO 9000 series will be necessary for businesses the world over to stay in business. A series of five standards, Chadha maintained that it was not to be confused with product standards. Instead, he called it a total quality management standard with inherent participation from the grassroot level upwards. Its applicability has far-reaching consequences, from toy safety to construction products and from housekeeping to record writing and retrenchment. The advantages of ISO as listed by Chadha are that it motivates exporters, sets a baseline, establishes reasonable standards for government procedures and sets general market procedures for regulating health and safety. He added that incorporating the system improves quality image along with efficiency. Referring to the most important aspect of the ISO series, that of granting marketing advantage and European Community '92 positioning, Chadha said that business men should gear up to meet the quality challenge and to become quality consicous.

Special fund for SSI facelift likely

A central fund, probably to the tune of Rs. 32,000 crore, for the modernisation and upgradation of the small scale sector is under the active consideration of the Centre.

The Union Secretary for Industry, **Mr. S.L. Kapur,** announced that the special RBI committee constituted to go into the working capital and rehabilitation requirements of the small sector, had worked out such a proposal that would soon be forwarded to the Prime Minister.

He was speaking at the inauguration of a national seminar on the role of SSI sector in the changing industrial and economic scenario, organised by the Federation of Associations of Small Industries of India (FASII) in Madras on June 12.

The Union Minister of State for Industrial Development, **Prof. P.J. Kurien,** who was also present at the meeting later endorsed that once the committee formalises the proposal for the modernisation fund, his Ministry would spare no efforts to have it passed. The committee report is to be submitted by June.

Touching upon the working capital problems of the sector, Mr. Kapur said, the RBI committee has worked out the credit requisites of the sector and would get them cleared by RBI and the Centre. Instead of the "Small industries Bank of India" mooted by FASII, he suggested that the Small Industries Development Bank of India (SIDBI) be asked to get into direct lending to help the sector. Similarly, all other commercial banks, following the example of the State Bank of India (SBI), should set up separate cells to cater to the needs of the small business.

Prof. Kurien, in his address, informed that the Prompt Payment Act is ready and is to be presented at the next Parliament session. The Limited Partnership Act, however, has run into rough weather with numerous obstacles impeding its processing, but the Ministry is fighting to have it cleared soon, he reassured.

In a word of advice, he said that the sector should become more competitive and should draw confidence in this regard from the fact that 40 per cent of its products is selling in the international market.

Further, the entrepreneurs need not feel threatened by the new industrial policy which allows the large sector to have 25 per cent participation in the small sector. The products that were in the SSI reserve list would continue to remain so and legal action would be taken against "encroachers".

The Centre is all set to start a quality campaign in the SSI sector and is to institute 10 quality awards in this connection for various industries in the sector, from next year. The industry needs to work towards meeting the ISO 9000 standard.

The Tamil Nadu Minister for Rural Industries, **Mr. Nagore Meeran,** told the gathering that the state government has worked out a target for setting up another one lakh SSI units in the state over the next five years.

SOUTHERN INDUSTRIALISTS SHOW GREAT INTEREST IN MIDC SCHEME

The Maharashtra Industrial Development Corporation (MIDC) has been organising 'on the spot allotment of land' in several prominent cities of the country. Recently, the Corporation had organised two programmes in the two southern cities of Madras and Bangalore.

The MIDC held detailed discussions with about 160 entrepreneurs from both the cities. According to MIDC officials, many of the entrepreneurs showed great interest in establishing industrial units in Maharashtra. Also many of them had come up with specific proposals.

Eighteen entrepreneurs submitted their applications together with the process fees at the venue itself. The Corporation has given a commitment to three entrepreneurs while issuing letters of offer to the other fifteen.

The locations chosen by these entrepreneurs in Maharashtra include areas like Waluj, Additional Mahad, Chincholi, Parbhani, Tarapur, Kurkumbh and Baramati.

MIDC officials said that many other entrepreneurs are in contact with them in Bombay and their proposals were being considered and agreements would be reached soon. The MIDC delegation that visited the two southern cities was led by **Mr. Prabhakar Karandikar,** Chief Executive Officer.

Other members of the delegation included **Mr. V.K. Date,** Joint Chief Executive Officer, **Mr. Riyaz Pathan,** Deputy Chief Executive Officer, **Mr. S.K. Ponkshe,** Chief Planner, **Mr. Padmakar Naik,** Technical Advisor and **Mr. Adinath Harwande,** Public Relations Officer.

TIMA PROMOTES CO-OPERATIVE SOCIETY

The Tarapur Industrial Manufacturers' Association (TIMA) has promoted a co-operative society for erection and maintenance of common effluent treatment plant for the Tarapur industrial area. The plant is considered to be the first of its kind in Bombay. The 'bhoomipujan' ceremony was performed by **Mrs. Parihar,** Chairperson of the Maharashtra Pollution Control Board.

PHDCCI seeks incentives for small-scale units

The PHD Chamber of Commerce and Industry (PHDCCI) has called for a single comprehensive legislation on labour laws for small scale industrial (SSI) units and a package of incentives to give a boost to this sector.

A strategy paper, prepared for a seminar on 'perspectives for industrial growth' held on June 16, has also suggested the constitution of Lok Adalats by banks and financial institutions (FIs) to settle disputes. PHDCCI has also mooted a proposal for introducing a comprehensive insurance scheme to cover mortgaged assets and liabilities of sick and non-viable units. The paper further states that growth funds be created by small scale industry, and contribution to these funds should be exempted from levy of income tax out of the net taxable income of SSIs.

The contribution to the growth funds once created by an enterprise would induce the promoters to expand and set up new ventures and make them growth oriented. It would also strengthen the working of institutions like the Small Industries Development Bank of India (SIDBI), the note says.

The chamber has suggested that in view of the increasing incidence of sickness in SSI sector, a settlement commission for settlement of cases related to rehabilitation and winding up of sick units, including the ones before courts of law, be set up. At present there is no such body to deal with sickness in SSI sector despite the alarming rate of sickness.

The chamber has also suggested that a separate companies act for SSI units which will require compliance of minimum statutory and procedural requirements be introduced. This should also include simplification of the format and system of filling returns. This type of act is prevalent in the United Kingdom where special consideration is given to small companies which need not file the large number of documents as was required to be done by larger companies.

It also strongly feels that an arbitration clause should be included in all loan or credit facility agreements. Through arbitration, settlement would be made in shorter period of time and reduce burden of courts. It would also help in saving huge amount which was locked up as unrecovered court fee from the banking system, the paper says.

GOVT. YET TO NOTIFY NEW EXIM POLICY

The Commerce Ministry appears to be slow in issuing notifications of the new Exim policy announcements. Export and trading house representatives point out that the Ministry has not so far made public the details of certain benefits, like special import licences, which were to be made available to them.

Para 142 of the new policy (1992-97) stated that export houses, trading houses and star trading houses will be entitled to special import licences, for such value or bearing such proportion to the net foreign exchange earned by them during the previous licensing year.

Under these licences, these houses will be allowed to import items included in the negative list as specified under a scheme to be notified in this regard. Nearly two-and-a-half months have lapsed since the announcement of the policy and the Commerce Ministry is yet to notify the scheme under the new policy which was formulated, it was claimed, to give a thrust to exports. Representatives of these houses told *The Economic times* that at a time when the country needed foreign exchange, the Commerce Ministry is taking its own time in announcing the scheme for grant of special import licences. The government has increased the thresh[old] limits sharply for giving recognition [to] exporters as export houses, trad[ing] houses and star trading houses. The foreign exchange earnings required [for] such a status are now placed at Rs. [..] crore, Rs. 60 crore and Rs. 150 cro[re] respectively.

The representatives assert that t[he] chief Controller of Imports and Expo[rts] should notify the scheme expeditious[ly]. Already, 100 per cent export-orient[ed] units (EOUs) and those set up in t[he] export processing zones (EPZs) a[re] facing problems regarding the sale of [..] per cent of their production in t[he] domestic tariff area (DTA) as the com[merce] ministry has not yet announc[ed] the procedure.

The Commerce Minister hopes th[at] exports would touch $20 billion [in] 1992-93 compared with $17.8 billion [in] the previous year, which witnessed a fa[ll] over the 1990-91 level when expor[ts] had exceeded $18 billion.

INDIA INVITED TO GLOBAL ENERGY MEET

Norway, Italy and Egypt have calle[d] for a new global energy policy inte[r]relationship to promote internationa[l] cooperation in addressing the importan[t] links between energy, environment an[d] economic development.

The inter-relationship is envisaged a[s] a cooperative network of confidence building contacts and meetings at politi[-] cal as well as technical level and on [a] bilateral, regional as well as globa[l] basis. To give further political impuls[e] to an on-going global energy polic[y] inter-relationship, the government o[f] Norway will, together with the govern[-] ments of Italy and Egypt host a work[-] shop at ministerial level at Solstrand outside Bergen on the western coast o[f] Norway on July 2 and 3, an officia[l] statement said at New Delhi.

Koreans keen to set up joint ventures in India

Koreans are keen to go for joint ventures with India for the manufacture of textiles, synthetic fibre and garments for third country exports, specially to the US and EEC. This was pointed out by the visiting Korean investment mission at the meeting with Indian industralists held under the auspices of India-Korea Joint Business Council (JBC) recently at New Delhi.

The Korean side said they could provide India technology for manufacturing synthetic fibre, fabrics and garments. Korea, it was pointed out, was a traditional exporter of textiles and last year's export was around $60 million. Leader of the Korean delegation **Mr. Kahns Jay Young** said the Korean foreign direct investment in India increased significantly in numbers to 12 projects as on the first quarter of this year. In absolute amount, it was still small and effort should be made to augment investment to India. India, he said, could emerge as a large market.

As Korean companies experienced difficult situation due to high trade barriers by the developed countries and domestic economic factors including high labour cost, economic co-operation between Korea and India would be viable and mutually beneficial, he said.

He said the investment mission would study in detail the investment climate in India and in the long term, he hoped that a more meaningful and constructive cooperation between the two countries would emerge.

Earlier, welcoming the delegates, **Mr. Arun Bharat Ram,** Chairman, Indian section, India-Korea JBC, invited Korean investment to India in sectors including food processing, electronics, oil drilling equipment, bio-technology and informatics. He said with the deregulation measures India had become an attractive source for investment and wanted Korea to take advantage of the huge size of Indian market and highly skilled managerial personnel. The Indian side pointed out that India and Korea could realign the production capabilities of each other in textiles and garments to capture the world market.

PROJECT TO MONITOR POLLUTION IN COAL MINES

The West Bengal Government has drawn up a project to ascertain environmental problems and monitor chemical pollution in the coal mine areas of Ranigunj in Burdwan district. The project entitled 'Environmental problems in Ranigunj coal mines and monitoring of chemical pollution' for a duration of one year will be implemented by Burdwan University.

Compulsory licensing list may be pruned

The Centre is seriously contemplating to prune the list of 18 industries which are under compulsory licensing, says **Prof. P.J. Kurien,** Union Minister of State for Industry.

The industries considered for delicensing will have to fulfil certain parameters such as, they should not cause pollution and that they should be environment-friendly. However, the list will not include industries which are of "strategic importance" to the nation, he said, addressing a seminar on "Industrial growth prospects in Maharashtra and new industrial and trade policies", at Bombay on June 9.

Prof. Kurien pointed out that the Government has opened the doors to new technologies which would help improve the quality of Indian products. He also pointed out that the Government will also allow experts or technicians from abroad "if it helps companies to improve the quality of their products". He is of the opinion that with the European Community forming a single block, it would be increasingly difficult for Indians to market their products unless they "upgrade their quality".

Only about 10 Indian firms have received the ISO: 9,000 certificate and more and more companies should strive for the same. The quality for international as well as domestic markets should be the same "as consumers in the local market are becoming increasingly aware of the best quality products available", he added. Stressing the quality aspect of the product, Prof. Kurien alleged that the private sector hardly spent on R&D.

To facilitate proper implementation of the new policy, Government has opened Investment Promotion and Project Monitoring Facilitation Cell to remove bottle-necks faced by investors and also to monitor the progress of industries. The foreign investment proposals approved after the announcement of the new industrial policy (from August 1991 to May 31, 1992) totalled upto Rs. 1,527 crores as against approvals of Rs. 129 crores during the corresponding period in 1990 while Rs. 300 crores investments were awaiting final clearance. These investments were in high priority sectors, he added. The Government has also received 5,000 applications for new investments against 3,000 for the period under consideration. It has also cleared 1,298 foreign technology agreements, 516 through automatic route and 782 through the Ministry of Industry. While the Centre is trying to remove all impediments in the way of investments, the State Government should help create infrastructure for the same, Prof. Kurien opined. Lauding the Maharashtra Government's new incentive scheme, he claimed that future prospects for industries in the state are "bright and promising".

However, the State was having the highest number of sick units. Prof. Kurien suggested that those units which cannot be revived/rehabilitated or chronically sick should be closed down. The clear cut legal closure will not only help the investors but also workers who otherwise are not paid their dues. Citing the example of a number of textile mills in Bombay and the hardship faced by workers, Prof. Kurien added that units should be legally closed. BIFR, an expert body should take decisions of "legally closing" the chronically sick units. In case companies do not have adequate finances Government will give "grants" under the National Renewal Fund, so that the workers are compensated, he added. Further, the Government will train workers and re-employ them. Under the special infrastructure development scheme, the Government has identified 40 backward districts which will be developed in the near future. It will also provide special protection to tiny sector, he added. Addressing the seminar, **Mr. Vilasrao Deshmukh,** Industry Minister of Maharashtra, said the State Government, besides providing capital incentives [to] entrepreneurs, will "concentrate [on] developing infrastructure particularly [in] backward areas."

Mr. Deshmukh claimed that the Sta[te] was in a better position to genera[te] power and presently about 8,500 mw [is] generated. An additional 4,000 m[w] would be generated by the end of Eigh[th] Five Year Plan, which will include mo[re] than 2,000 mw by private sector, [he] said. **Mr. N. Biswas,** Secretary (Technical Development) and Director General, in his keynote address said the Government should ensure that the environment is preserved and there is n[o] pollution while taking the industries [to] the rural and backward areas. Earlie[r] **Mr. C.Y. Pal,** President, Bomba[y] Chamber of Commerce and Industr[y] welcomed the guests. Mr. Pal, felt th[e] role of state governments would hav[e] to be more competitive to attract industries to their states.

DGTD TO TAKE UP PROMOTIONAL WORK FOR INDUSTRY

The Directorate General of Technical Development (DGTD) has decided to undertake promotional work for the industry, according to **Mr. Lakshman Mishra,** Deputy Director General DGTD. Speaking at a press conference organised in Bombay on June 4 by the Bombay Chamber of Commerce & Industry (BCCI), he said under its promotional programme, the DGTD wil[l] organise industrial seminars/workshops in close association with the State Governments and the local trade associations/chambers of commerce.

The seminars will act as forums for entrepreneurs to know about future prospects based on local resources in the light of the liberalised policies. The liberalised policies will have a limited impact unless complimented by suitable steps undertaken by the State Governments. These forums will convey the message of liberalisation at the State level.

Highlights in Chemical Technology

CHROMATOGRAPH 'FISHES' FOR HEAVY METALS

Liquid chromatography, normally used for smallscale product purification, may be used to remove heavy metals from a Superfund site — a 17-billion-gal lake in what was the Berkeley Pit Copper Mine (Butte, Mont.). In laboratory tests, ChromatoChem Inc. (Missoula, Mont.) has used chelating chromatography to reduce the level of copper, zinc, manganese, iron and other contaminants in the lake's water from 200-1,000 ppm to less than 50 ppb, says Richard Hammen, the company's president.

The appeal of ChromatoChem's process is the rapid flowrate — 10-40 column volumes/min, compared with 10-30/h for conventional chromatography. In the latter, the limiting factor is the rate at which metal ions diffuse into the pores of the chelating substrate (typically polystyrene beads). In contrast, ChromatoChem attaches the chelating agent to a "spacer" — a large, proprietary molecule, about 50 angstroms long — that is attached to silica-gel beads. The spacers "dangle into the solution like fishing lines to capture metals," says Hammen.

A 5,000-gal/min plant should cost $10 million, with operating costs covered by recovery and sale of metals. The alternative — lime precipitation —would cost $17 million for a 3,500-gal/min plant, plus $4.5 million/-year in operating costs, with no metals recovery. *(Chem Engg.*, March 1992).

LEACHING PROCESS LIGHTENS A HEAVY-METAL LOAD

A leaching process to remove all heavy metals (except mercury) in contaminated sludges is getting a tryout in a $0.5-ton/h pilot plant. Jointly developed by Germany's Rudolf Otto Meyer (Hamburg) and Industrie Automation (Heidelberg), the process can cut the level of heavy metals, such as copper and cadmium, by more than 90%.

In the pilot plant, metals are leached from the soil by hydrochloric acid at pH 2. The leachate is filtered, and the dissolved metals separated in a two-step process: First, iron is precipitated at a pH between 3 and 6 by adding sodium hydroxide; next, the pH is raised to 12, by adding more NaOH. All other metals present are precipitated as carbonates by bubbling CO_2 through the solution. The hydroxide and carbonate precipitates can be treated to recover the metals.

A key benefit of the process is that it can handle soil particles bigger than 33 micrometers in diameter, a problem for other leaching processes, says Jens Niemann, project engineer. Dredged sludge from harbors, sewage sludge and incinerator flyash are target markets for the process. The treated sludge can be used as a filler in construction material. *(Chem Engg.*, March 1992).

A CHEAPER COATING FOR PHOTOVOLTAICS

A vapor-deposition process developed by Battelle Institute (Frankfurt, Germany) promises to cut the costs of thin-film photovoltaic cells by a factor of five, to $1.30/watt (based on a projected production of 100,000 m^2/yr). Called Closed Space Sublimation, the method coats standard window-grade glass with cadmium telluride (CdTe), building films at a rate greater than 10 micrometers (thickness) per minute. CdTe has a photovoltaic peak-efficiency of 11%, compared with 8% for amorphous silicon.

A flat block of CdTe, heated to 700°C, is held 2-3 mm above the glass surface, which itself is at 500°C. Because of the temperature gradient, the CdTe sublimes across the gap onto the glass. A 1-millibar vacuum and an inert nitrogen purge prevent contamination of the coating. The next step is to modify the batch process for continuous operation, says project manager Dieter Bonnet. Battelle is also seeking industrial partners to build a continuous pilot plant. *(Chem Engg.*, March 1992).

EUROPEAN RESEARCH TARGETS SOME NOVEL CATALYSTS

The European Community has launched a four-year research project to find more-selective replacements for current zeolites and to design solid catalyst replacements for liquid-acid and-base catalysts used in the petrochemical and waste-disposal industries. One research focus will be so-called "pillared" catalysts, in which clays are impregnated with pillars of alumina or zirconia to create interior channels, says Norman Jorgensen, a project manager of the Atomic Energy Authority Laboratory (Harwell, U.K.). The project's $3.4-million budget will be shared by the EC and industry, while the research will be split among laboratories in France, the U.K., Italy and Germany. Catalysis is one area targeted for publicly funded research by the Council of European Chemical Manufacturers (p. 46). *(Chem Engg.*, March, 1992).

PLASTICS RECYCLING PLANT GOES ONSTREAM

A recycling plant for high-density polyethylene (HDPE) has been started up in Tulsa, Okla., by Phillips Plastics Recycling Partnership, a joint venture of Phillips Petroleum Co. and Partek Corp. (Vancouver, Wash.). Partek, a privately owned recycler, has supplied some technology for the 18-million-lb/yr. (of recycled plastic) plant.

Incoming bales of containers are broken up; then, a tumbler separates bottle caps, a magnet removes metals,

and non-HDPE containers are hand-separated. HDPE is ground into flakes, which are washed and hydrocycloned to separate paper and other plastics. Labels and glue are removed by a proprietary method involving abrasion, and not with a solvent. Finally, the plastic is melted, extruded and pelletized.

Recycled translucent and colored material is sold separately, since the pigment cannot be removed. The new plant is expected to be a money-loser for the next two or three years because of the low prices of natural HDPE (7-9 cents/lb), but should be profitable in the long term. *(Chem Engg.*, March 1992).

PROTECTIVE SUITS GO TO THE CLEANERS

Normally, protective clothing contaminated during the disposal of chemical, biological or nuclear wastes are destroyed, but a $1.2-million project under development at Deutsche Aerospace AG (Munich) for the German armed forces aims to reclaim the clothing for reuse. Called Dekont, the process can treat most clothing types, including lead-lined and pressurised suits.

The first decontamination unit will be built on a 13-m-long truck-trailer, and will use jets of air and 170°C steam to denature and remove contaminants. The wastewater is collected and treated before disposal. The prototype is expected to be complete in early 1993, with each unit capable of decontaminating up to 63 suits/h. In related news, a just-released study by Frost and Sullivan (New York) predicts that the market for such protective clothing will grow from $30 million in 1991 to $55 million by 1995. *(Chem. Engg.*, March 1992).

TREATING WASTES BY GIVING THEM A PULSE

Pulse combustion — used for drying heat-sensitive chemicals and foods, and incinerating wastes (*CE*, November 1990, p. 28) — is getting a chance to gasify wastes in a fluidised bed. Last month, Inland Container Corp. (Ontario, Calif.) started up a demonstration project to gasify paper and plastic wastes that are generated in processing the 100%-recycled paper feedstock employed at its containerboard facility. Currently, the waste, some 5-10% of the feed, is dewatered and landfilled.

In pulse combustion, fuel is burned in a specially designed chamber, causing minor explosions that drive out the combustion gases and creates a series of high-frequency pulses. In the demonstration unit, built by MTCI Inc. (Santa Fe Springs, Calif.), these pulsing combustion gases are fed into 72 tailpipes that pass through and indirectly heat a fluidized-bed gasifier.

Such "pulsed" heating is five times more efficient than conventional heating, says K. Duraiswamy, a senior vice-president of MTCI. In the 1-ton/h gasifier, the carbon in the wastes reacts with steam, generating a 30-50% H_2-rich syngas. About half of the syngas is then used to fire the pulse combustor. *(Chem. Engg.*, March 1992).

BIOREACTOR OFFERS HIGHER SO_2 REMOVAL EFFICIENCY

A novel bioreactor, developed by Mexico's Cydsa Group (Monterrey), is removing 98% or more of the sulfur in the offgases from a cellophane-film plant in Monterrey, much higher than the 90% maximum now converted by conventional bioreactors. A pilot bioreactor, called Biocyd, has been in operation since last June, and consists of a tower that has naturally occurring, sulfur-eating bacteria immobilised on a a honeycomb packing made of plastic.

Gas containing sulfur-bearing compounds (e.g., sulfuric acid or mercaptans) is introduced at the bottom of the tower, and nutrient-laced water at the top. The elemental sulfur produced by the contaminant-eating bacteria washed out in the water and recove[red.] The clean water is recycled.

The tower enables higher throughp[ut] for a given volume than do conventio[nal] bioreactors, and so promises to be [less] expensive, says Victor Morales, dir[ec]tor of technology for Cydsa's Envir[on]mental Improvement Div., wh[ich] provides environmental engineering [and] consulting services. An industrial-sc[ale] unit, five times bigger than the pres[ent] 5,000-ft³/min pilot unit, will be in op[e]ration by yearend. *(Chem. Engg.*, Ma[rch] 1992).

MOBILIZE ENZYMES TO ROU[T] GROUNDWATER NITRATES

An electrochemical-enzymatic pr[o]cess for detoxifying groundwater p[ol]luted by nitrate fertilisers has be[en] developed jointly by Mobitec Gmb[H] (Gottingen, Germany) and Michig[an] Technological University (Houghto[n,] Mich.). Nitrates in groundwater are [a] health hazard. But current method[s] such as those using live bacteria, f[or] removing nitrates are either slow, ine[f]fective or difficult to maintain, says St[e]phan Diekmann, a researcher [at] Mobitec.

In Diekmann's technique, th[e] groundwater passes through an electro[ly]lytic cell containing three types o[f] enzymes that are co-immobilised on [a] polymer matrix. The first enzyme is [a] nitrase reductase derived from maiz[e] *(Zea mays)*, which reduces nitrates t[o] nitrites; a second enzyme, derived fron[m] the *Rhodopseudomonas* bacterium, con[]verts the nitrites to nitrogen dioxide, and the third enzyme, also from *Rhodopseu[]domonas*, reduces the NO_2 to iner[t] nitrogen.

The enzymes are aided in this redox process by a cofactor, a electrically conductive dye that transfers electrons from the electrodes to the enzymes. Mobitec is building a 5-L/min reactor, which will cut nitrate levels from 50 mg/L to essen-

tially zero. "The process, could be used with high-nitrate industrial waters," says Diekmann, "since higher the nitrate level, the better the enzymes work." Other water contaminants, such as pesticides, can also be treated if appropriate enzymes and cofactors can be identified. *(Chem. Engg.*, March 1992).

WASTE OIL REPLACES CRUDE AS A PETROLEUM REFINERY FEED

Lyondell Petrochemical Co.'s refinery in Houston is now producing standard-grade gasoline and heating oil by passing waste lubrication oil through the coking furnace. The firm says that this is the first U.S. refinery to use lube oil to partly displace crude as a commercial feedstock.

In practice, the lube oil is blended with standard coker feedstock and fed to the 700°F furnace. Lyondell says that the coke, heating oil and gasoline products generated using recycled oil do not show increased levels of heavy metals, which was one of the main worries facing the process's developers. Initially, the company plans to recycle 7.5 million gal/yr of lube oil, but this could increase to 30 million gal/yr — still only about 1% of the plant's crude-oil demand. The U.S. Environmental Protection Agency (Washington, D.C.) estimates that less than 2% of the 1.3-billion gal/yr. of waste lube oils generated in the U.S. are re-refined. Approximately 58% is burned as supplemental fuel, mainly in cement kilns, while 32% goes to landfills. *(Chem. Engg.* March 1992).

CATALYZE PULP WASTES TO OIL FRACTIONS

The German Institute for Wood Chemistry (Hamburg) has come up with a way of catalytically hydrogenating lignin into light and heavy oils. It is estimated that the pulp and paper industry worldwide incinerates or dumps more than 130 million tons/yr. of lignin, a macromolecule that binds the cellulose fibers in wood. However, carbon taxes in Europe have spurred interest in employing biomass feedstocks since these result in no net contribution to atmospheric carbon.

In the laboratory process, hydrogen is fed continuously to a 1-L autoclave, where a molybdenum-nickel catalyst cracks the lignin at 400°C and 2 bar pressure. The cracker products are phenol, creosote and silanes, leaving about 3% solid residue. The next step is to build a 1-kg/h pilot plant, as part of a $19-million federal biomass-research program, says Dietrich Meier, the project director. Further work will include automating the lignin-feed system, which he says should help make the process economically competitive with coal gasification. *(Chem. Engg.*, Feb. 1992.)

INCINERATING DIOXIN IS NOW A COMMERCIAL OPTION

Morrison Knudsen Corp. (Boise, Idaho) is the first company to receive certification for a hazardous-waste incinerator to destroy 2,3,7,8 TCDD, or dioxin, and its toxic isomers in North America. The certification has been granted by the Arkansas Dept. of Pollution Control and Ecology to process contaminated materials, some containing dioxin, at the Vertec Chemical plant site in Jacksonville, Ark. This authorisation follows a two-year development effort that concluded in a trial burn last October, during which the incinerator successfully met the specified 99.9999% destruction of a surrogate material, hexachlorobenzene, and when particulate emissions were one-twentysixth less than that mandated by law. *(Chem. Engg.*, Feb. 1992).

SPENT PLASTICS ARE REFORMED INTO VIRGIN MONOMER

By converting waste thermoplastics into a syngas mixture, the Institut fur Kunststoffverarbeitung (IKV; Aachen, Germany) has come up with a process for reconstituting waste thermoplastics into the original monomers, thus closing the material cycle. In the technique, spent plastics are processed in a twin-screw extruder at more than 400°C, fracturing the polymer chains into paraffins and other oil-like substances. Contaminants, such as chlorine from polyvinyl chloride, are removed using a cascade of two extruders, where the exit temperature (350°C) of the first extruder is high enough to form hydrogen chloride (which is captured), but not high enough to form the oils.

Next, IKV compresses the extrudate to between 100 and 150 bar and feeds it to a standard, noncatalytic gasifier at 1,400°C and 50 bar. The resulting carbon monoxide-hydrogen mixture can then be processed normally into virgin monomers. In laboratory trials with a 30-mm-dia. extruder, polypropylene, polyethylene and polyvinyl chloride have all been recycled at throughputs of up to 6 kg/h. IKV estimates process costs to be between $25 and $88/ton, depending on the thermoplastic recycled. *(Chem. Engg.*, Feb. 1992).

A SUPERCRITICAL WAY OF RECOVERING WASTE SOY OIL

Supercritical extraction is finding favor for cleaning and recycling adsorbent wastes from vegetable-oil refining with scientists at the U.S. Dept. of Agriculture (USDA). The process could mean less use of landfills to dump the wastes, and fewer fire hazards from oil-soaked wastes, which are prone to spontaneous combustion on hot summer days, says Jerry King, a USDA chemist who heads the project at the National Center for Agricultural Utilisation Research in Peoria, Ill.

An average soybean-oil refinery generates about 5,000 lb of spent bleaching clay every day. The refineries can chemically treat the clay to remove the

oils, but the treatment also generates its own waste chemicals that need be safely disposed of. By treating the clay with supercritical carbon dioxide at 178°F and 12,000 psi, however, King says almost 100% of the oil can be recovered and the clay recycled. Preliminary cost estimates indicate that the supercritical process compares favorably with current chemical-treatment technologies. *(Chem. Engg.*, Feb. 1992).

ELECTRONS MAY BE THE SOLUTION FOR NASTY POLLUTION

Los Alamos National Laboratory scientists are also collaborating with researchers at Florida International University and the University of Miama (both of Miami) to destroy hazardous wastes, using an electron-beam accelerator.

In pilot tests at a Dade County, Fla., municipal-waste-treatment plant, university researchers scanned a thin, 100-gal/min waterfall with an electron beam, to achieve 80-90% destruction of such hazardous pollutants as benzene, trichloroethylene and phenols.

The Dade County work used a continuous beam of 1.5 MV and 50 mA, but the collaborative project will use a more-powerful Los Alamos accelerator of 1.5 MV and several thousand amperes, in 100-nanosecond pulses.

The treatment cost is around $10 per 1,000 gal, which would make it less expensive than activated carbon (because of the regeneration cost), says Louis Rosocha, deputy group leader of the Los Alamos tunable lasers and applications group.

Competitiveness with ultraviolet oxidation would depend on the waste, he says, because the electron beam (unlike UV) is not affected by the solids or minerals content. *(Chem. Engg.*, Feb. 1992).

REMOVE COATINGS BY WATER AT SPEEDS UP TO MACH 3

Flow International Corp. (Kent, Wash.) has introduced a new coating-removal system that uses ultrahigh-pressure water jets to cut processing time and costs, and increase safety. The system removes both ceramic thermal-barrier coatings and plasma-sprayed metallic coatings, which are used for surface hardening heat-exchange tubes, pump stators, bearings and other process equipment.

Flow employs a patented intensifier pump to pressurize water up to 55,000 psi and spray it through multiple rotary nozzles. The waterjets, which reach speeds up to three times the speed of sound, are precisely trained on a part to remove the coatings.

Treatment time for ceramic thermal-barrier and plasma-sprayed coatings is as little as 8 h and 1 h, respectively; in contrast, the same coatings would require a 22-h soaking in acid, acid stripping, hand brushing and blasting with aluminum oxide grit, and an 8-h process of mechanical machining and finishing in toxic sodium cyanide. *(Chem. Engg.*, Feb. 1992).

ALKYLATION OCCURS WITHOUT AN ACID

Alkylation in petroleum refineries is done by means of either a hydrogen fluoride or a sulfuric acid catalyst, neither of which is well regarded from an environmental viewpoint (CE, May 1990, p. 39). Catalytica (Mountain View, Calif.) believes that it has a solution to the problem in a process that uses a solid catalyst, and the firm's opinion is shared by Conoco (Houston) and Neste Oy (Espoo), the Finnish oil company.

The three companies have formed a joint venture to pursue commercial development of the method, and plan start up a pilot plant this fall at Neste research and development center Porvoo, Finland. Catalytica will n elaborate on the catalyst or process co ditions, but says the route could be re rofitted in existing facilities and be mo economical than current ones.

U.S. refiners are expected to add sub stantial alkylation capacity in the nex few years in order to meet the octan needs of reformulated gasolines, whic are mandated by the Clean Air Ac Amendments of 1990. *(Chem. Engg* Feb. 1992).

A CLEANER, CHEAPER ACETALDEHYDE ROUTE DEBUTS

An acetaldehyde process that essen tially eliminates the toxic byproducts o the conventional Wacker-type metho is being offered for licence by Cataly tica (Mountain View, Calif.). The pro cess has been successfully tested at ful scale in an undisclosed plant and can be used in existing two-stage plants with little or no hardware modification, says John Grate, a senior research fellow with Catalytica.

Acetaldehyde is currently made by oxidising ethylene, using a palladium catalyst with a copper chloride cocatalyst; however, the process requires the addition of large amounts of hydrochloric acid, which, in turn, generate large quantities of toxic chlorinated-organic byproducts.

Catalytica's new route avoids this by substituting phospho-molybdovanadate polyoxoanions for the copper cocatalyst, vanadium being the active element. The main byproduct is acetic acid, which can be recovered or biodegraded.

Some chloride is required to maintain catalyst stability, but Grate says the amount is less than 1% of the conventional method. *(Chem. Engg.*, Feb. 1992).

Science Briefs

LIFE ON THE OCEAN FLOOR

Using a robot vehicle -- consisting of several pressure resistant cylinders housing a range of instruments -- scientists are building up a vivid picture of marine life at depths of down to 6,000 metres.

A total of 23 dives in the Atlantic and Pacific oceans has confirmed the ability of the robot to see and track fish that live at such depths. Engineers at Aberdeen University have made modifications to the equipment which can take photographss, tag individual fish, follow their movements, monitor the environment and return to base with data for analysis.

Oceans cover more than 70 per cent of the earth's surface and a little over 40 per cent is 4,000 or more metres deep. Yet arguably more is known about outer space than this area of our planet. Imagine, for instance, investigating an animal so adapted to the deep-sea environment that no one has ever brought back a specimen alive.

On the sea floor beneath the productive surface layers, there is a rich community of animals including scavenging fish, notably grenadier fish of the genes *Coryphaenoides*. But how much other life is there and how is it sustained by the downward flux of nutrients from the surface?

The Aberdeen University Deep Ocean Submersible, or AUDOS as it is known, is claimed to represent the first attempt to apply the tracking techniques used in terrestrial or shallow-water ecology to the deep ocean.

Transmitters developed at the University are small electronic devices that emit acoustic pulses at 77 kHz, which is beyond the range of hearing of most marine animals. Scientists have found that baited transmitters placed within view of cameras on the sea floor are almost invariably swallowed by the scavenging grenadier fish, attracted by the odour of the bait. A scanning hydrophone monitors the direction and range of each fish that ingests a transmitter, and vertically spaced hydrophones monitor their altitude.

The scientists have discovered that populations of grenadiers can range from 50 per sq. km. in food limited areas to six times that number in productive areas of the ocean depths. Broadly, they will eat almost anything -- star-fish, crustaceans and worms.

DETECTING ENVIRONMENTAL CHANGE

An early warning system just launched in Britain will detect environmental change and its impact on the ecology of the country.

Led by the UK Natural Environment Research Council (NERC), the Environmental Change Network (ECN) is the result of cooperation between nine official bodies concerned with agriculture, forestry, water, conservation and the environment.

Under the first phase of the project, an integrated detection system will be installed at eight designated sites in Britain and used to measure climate, air pollution, soil chemistry and water quality as well as vegetation and animal indicators of change. Additional sites will be chosen at later stages to ensure that the ECN is representative of the major land and freshwater environments of the UK.

The eight founding sites include upland, lowland and hilly areas as well as woodland, grassland and arable sites, and are located in different parts of the country.

The ECN launch comes at a time when the world has just had two of the warmest years on record and Britain has seen a series of mild winters, droughts in the south, and floods and gales in the north. The pollution climate is changing with reduced sulphur emissions but increased atmospheric carbon dioxide and nitrous oxides. Land use and management are also undergoing rapid change.

NERC's Director of Terrestrial and Fresh-water Sciences, Dr. Bernard Tinker, says: "It is only through long-term observation of sensitive indicators that we can begin to distinguish genuine trends from short-term fluctuations. We must also ensure that we can identify local variations from the national pattern."

"INSTANT" CHEMICAL ANALYSIS

An innovative but simple printed liquidic circuit system for performing "on-the-spot" chemical analysis, which can replace expensive and time-consuming laboratory tests, has won the top award in Britain's annual national inventions competition.

The winning invention was conceived by a team of scientists led by Mr. Roger Bunce and Dr. Gray Thorpe from the Wolfson Research Laboratories at Birmingham University in the English Midlands. With the printed liquidic circuit, an analysis can be carried out while a patient is present in a doctor's surgery and the treatment prescribed immediately.

The device can test for a wide range of conditions including pregnancy, HIV antibodies and levels of cholesterol.

Other applications include "over the counter testing". Several analyses can be conveniently handled simultaneously.

The Birmingham scientists are now looking beyond healthcare to other opportunities for decentralised testing. For example, the early detection of mastitis in cattle, the measurement of nutrient levels in soil and crops, and spot-checks of food products.

The Wolfson team's analysis system also won the university/college category in the competition and collected a total of £15,000 in prize monies.

Among other winners of the Toshiba Year of Invention awards, which are organised by the Confederation of British Industry (CBI) were two divers, Moss Mustafa and Richard Tomlinson, who have produced a linear angular measurement gauge that enables deep-sea divers, for the first time, to take accurate measurements of the angle and depth of cracks in the North Sea oil and gas rigs.

Winner of the school category was 15-year-old Richard Mead with his invention of Powersave, an energy control device for buildings which is cheap, safe and easy to install.

NEW WAYS TO IDENTIFY BACTERIA

In the knowledge that only 1 per cent of the world's bacteria have so far been identified, researchers from Britain's Agricultural and Food Research Council (AFRC) are pioneering new techniques to establish the "family tree" of bacteria.

Even in the well-studied case of human sewage, the AFRC estimates that only 10 per cent of the organisms present, representing "the tip of an iceberg", have been identified. So far, Man's knowledge has been limited to those bacteria that can be cultured in the laboratory but it is now recognised that a large proportion of bacteria cannot be cultured by existing methods.

In the past, identification has been mainly based on behavioural characteristics, which have proved to be an unreliable guide to genetic make-up. But new molecular techniques allow researchers to identify and classify bacteria into reliable genetic groupings, providing a way of rapidly assessing newly-discovered species of bacteria.

The techniques are based on mapping the molecules in the ribonucleic acid of the ribosomes, which form the sites of protein synthesis in the bacteria. AFRC says: "These molecules, known as rRNA, can be regarded as chronometers that record the ancestral inter-relatedness of bacteria because their nucleic acid sequences contain regions that change at different rates during evolution."

Parts of the sequences change only very slowly, so similarity in those regions indicates that organisms are at least distantly related. Other parts change more rapidly, so similarities suggest a close genetic relationship.

The AFRC scientists can now quickly obtain an rRNA sequence from a microcolony consisting of only 100 cells, using the polymerase chain reaction (PCR) technique. By extracting the total nucleic acid from a mixed population of organisms, using PCR clothing, fragments can be sequenced and used to create a genealogy of the bacteria.

Benefits of rRNA technology will be especially useful in the field of "probiotics" -- the technique of using cocktails of harmless bacteria, for instance, to treat animal illnesses. Companies making probiotics need to be sure of what they contain to avoid any risk of transferring pathogens. Also, knowing the exact constituents of the cockt will enable its organisms to be elin nated in any later investigation of po sible sources of infection.

FOOL-PROOF FINGER PRINTING

The latest genetic identification tec nique developed by British scientist makes DNA fingerprinting a quicke more accurate, and easier technique use than before.

Prof. Alec Jeffries of Leicester Ur versity in the English Midlands, wh originally invented the DNA fingerpri tin technique in 1984 (commonly use for instance, to establish paternity), h worked with colleagues to develop new computer technique to carry o comparisons between samples of ge etic material. It can be used to analy blood, semen, saliva, hair roots and on.

Previously, the method depended o a visual comparison of the lengths DNA sequences, with the possibility human error. The new technique based on checking sequence variatio rather than length, in small sections DNA called mini-satellite alleles. Th is both completely objective and muc more detailed, making it many tim more sensitive to variations.

Based on the polymerase chain rea tion (PCR), the new digital analys approach is known as mini-satellite va iant (MVR) mapping. In interprets va iability between pairs of alleles as digital code, which produces an unam biguous signature as it is between 5 and 70 numbers long. It can be used o many different parts of the DNA, an can even be used to compare mixe DNA samples for instance, from semen-bearing vaginal swabs in rap victims, and is expected to be particu larly suitable for forensic work, as it can be used with degraded DNA sample from a decomposing body.

The UK chemical company ICI, which is to launch the new test, said it was a major improvement which would cut the time taken to produce the genetic fingerprint from four weeks to two days. As it is also said to be some 100 times more sensitive than the present method, much smaller samples could be successfully used.

"We have never found two people who share the same digital code," said Prof. Jeffries, who pointed out that "the second very important point is that the digital information internally checks itself for consistency."

He said that while it would be difficult to use the established type of DNA fingerprints to set up a large database, for example, of known sex offenders, the new method was so fast that "what we now have is a digital approach which makes mass surveys technically feasible."

COMPUTERISED JOINT DESIGN

Professor Peter Walker uses Computer-Assisted Design and Manufacturing (CAD-CAM) techniques to produce individualised hip joints, in the Department of Biomedical Engineering at the Royal National Orthopaedic Hospital, London.

In many cases of joint replacement a standard implant can be used, however, to provide long lasting hip joints, particularly of the young active patient, close fitting custom hip joints are required. Such joints are also necessary in the case of severely deformed joints or when a conventional artificial hip has failed and needs revision.

Through the analysis of special radiographic views and computed tomography scans the overall outlines and key dimensions of the femur can be determined. The data is input to the computer by digitising and from this a specially written software package takes over. The first stage is to predict the three-dimensional shape of the femur using a computer data-base of femoral shapes. The software package then designs an optimally fitting artificial hip, based on achieving a precise fit inside the bone canal. The operator of the workstation in collaboration with the surgeon can select from a number of variables of the hip design. For example, it can be made longer or shorter depending on the strength of the bone. Collars can be added at the top, to provide extra load support if the bone is weak or if there is a fracture. The femoral head and neck can be twisted around to account for abnormal femurs often seen with younger patients.

Once the hip is designed further software works out the paths of cutting tools to manufacture it from a bar of titanium alloy. The CNC (computerised numerically controlled) machine then takes all instructions directly from the computer and manufactures the hip. Final finishing, including the provision of spherical femoral heads, is carried out in the department's machine shop. From receiving the radiographs to producing the final hip can be completed in two days.

BIOTECHNOLOGY MIMICS IMMUNE SYSTEM

Scientists have succeeded, for the first time, in making human antibodies in a test tube. This gives promise of better therapy for such diseases as cancer and AIDS, and less need for the medical use of animals.

Described as a world first, the making of specific antibodies entirely outside the body, without the need for immunisation, is the result of collaboration between the UK Medical Research Council's Centre for Protein Engineering in Cambridge, eastern England, and the Cambridge Antibody Technology company. Antibodies are the protein molecules in the blood that are produced by the body when it is threatened by foreign bacteria and viruses known as antigens.

In a report to the *Journal of Molecular Biology*, the team says it has used biotechnology to mimic the body's defence system. Human antibody genes were inserted into the genetic material of bacterial virus phages in such a way that when a phage infects a bacterium, it also instructs it to make antibody. Each phage displays a different antibody on its surface.

In order to find which antibody binds to a particular antigen, phages with displayed antibodies are exposed to the antigen. Those phages that do not bind are washed away while those that do can be harvested from the surface. In this way, a single binding phage, out of a vast repertoire of more than 10 million can be identified as carrying the particular genes for making the right antibodies to combat specific invading bacteria or viruses. The antibodies, which can then be produced in quantity by growing the phage in bacteria, can also be improved by mutation and further rounds of selection, as in the natural immune system.

Head of the Cambridge group, Dr. Greg Winter, commented: "We have been able to make human antibodies that bind tightly to both large and small molecules. Once the new technique has been used to construct a new phage repertoire, it can be used many times to make antibodies against different antigens."

INSTRUMENT IMAGES CHANGE IN SKIN BLOOD FLOW

Researchers at Newcastle-upon-Tyne General Hospital in north-east England have developed a novel medical instrument that can image the changes in skin blood flow resulting from injury, disease or temperature. Knowledge of skin blood flow is important for many area

of medicine such as plastic surgery, burn management, dermatology and vascular medicine.

Unlike existing laser Doppler instruments, which operate at discrete sites, the new instrument uses a scanning laser Doppler technique. A laser beam scans the patient's skin and the movement of blood cells in the capillaries under the surface of the skin causes a 'doppler shift' in the reflected light frequency.

The greater the velocity of the blood flow, the greater the shift. The velocity at any point can then be represented by a colour, and these point measurements are built up pixel by pixel, line by line, like a television picture. The resulting image allows the doctor to examine the adequacy of the patient's peripheral blood circulation.

The scanner does not touch the patient's body, so there is no risk of contact with open wounds, nor can it influence the rate of blood flow, in contrast to existing instruments. In addition, the normal small movements caused by breaching do not affect the resulting image.

Image processing and analysis software are now being developed in conjunction with the clinical evaluation of the instrument. Trials with the instrument are now in progress in various areas of medicine, including dermatology where the efficacy of drug treatment in conditions such as psoriasis is being assessed, and burn management where the viability of skin and skin grafts is being examined. Additionally, research projects are being planned to examine its potential in breast tumour detection, and to study pressure sore formation.

The new imaging technique has been patented by the British Technology Group, which is also funding futher development of it.

SHEEP PRODUCE HUMAN PROTEIN

The prospect of using genetic engineering to obtain commercial quantities of medically important human proteins from animals has been advanced by the success of British scientists in producing large amounts of human a1-antitrypsin (AAT) in sheep milk.

This is said to be the first demonstration that transgenic technology works at commercially useful levels in a large production animal. Making therapeutic proteins in this way has the potential to dramatically reduce the cost of production compared to the alternative of isolating such proteins from collected human blood, or in cell culture in large fermenters.

The new technology developed at the UK Agricultural and Food Research Council's (AFRC) Edinburgh Research Station and now being used by Edinburgh-based Pharmaceutical Proteins Ltd. (PPL) means that human proteins can be isolated from sources such as sheep milk in order of eliminate the risk of contamination with human pathogens such as hepatitis virus and the AIDS virus. PPL has shown that the protein is easily isolated from the milk, and is biologically indistinguishable from the normal human protein. The sheep used are completely healthy and have a normal lifespan.

The same technology can be used for the production of a range of other human proteins which are used therapeutically. This may be applicable to cow's milk, where it could be used, for example, to alter types of protein present in the milk. Enhancing digestibility to meet special dietary needs such as those of very young babies is one application which PPL will explore.

Scientists at the Edinburgh Research Station were the first to show that it was possible to produce medically useful proteins in the milk of sheep carryin introduced human genes. For exampl the gene for the human blood clottin protein, Factor IX, was successfull transferred to sheep.

DRUG CUTS BLEEDING IN SURGERY

The elimination of blood transfusion during major surgeries is in prospect, a a result of a chance finding at a Londo hospital.

Cardiac surgeons at the UK capital' Hammersmith Hospital found that drug used in the treatment of pancrea titis since the 1930s stopped excessiv bleeding during open heart surgery Other studies have also confirmed thi "dramatic effect".

In a number of trials, the use of th Trasylol drug marketed by Bayer, UK resulted in a significant reduction in blood loss during surgery, and the need for transfusions had, in many cases been abolished.

Doctors now believe that the drug will prove useful in a wide range of major surgical operations, and will be welcomed by Jehovah's Witnesses who are not allowed blood transfusions and will also eliminate any risk of AIDS and hepatitis being transmitted from donated blood.

It could not only help patients under-going open heart surgery and heart-lung transplants but also those having brain operations, liver transplants and stomach and orthopaedic surgery. Professor of medicine at Leeds University in northern Endland, Prof. Colin Prentice, says: "Eventually, it could be used for any big, bloody operation."

Prof. Ken Taylor, chief cardiothoracic surgeon at Hammersmith Hospital, commented; "The ability to prevent excessive bleeding and reduce or even

eliminate the need for blood transfusion in cardiac surgical patients is a major advance in the safety of heart surgery, which now numbers over 25,000 procedures annually in the UK alone."

Dr. David Royston, consultant anaesthetist at the Harefield Hospital heart and lung transplant centre in London, said enthusiastically: "This has revolutionised my life. The benefits to the patients are astronomical." Previously, one in six patients receiving heart-lung transplants had died within the first few months of surgery because of bleeding. But only two out of 62 patients, given the drug in a recent trial at Harefield, had died from bleeding.

NATURAL REMEDIES

The well-established folklore -- that garlic is good for you -- is now under scientific investigation at Wolverhampton Polytechnic's School of Health Sciences, in the English Midlands.

PhD Student Mahmood Khan takes a sample from an egg-yolk obtained from hens which have been fed garlic extract -- as part of his thesis which focuses on the egg-yolk's cholesterol-reducing effects of various dietary agents. Results so far indicate that garlic has a substantial impact upon cholesterol metabolism in the laying hen.

The resulting data is also being used by other study groups in the department who have joined forces with the Garlic Research Group to examine the effects of garlic on enteric bacteria (the bacteria which live in the human gut), and the possibility that it may also reduce human plasma cholesterol. Results so far have been encouraging but are not yet conclusive.

A further project is planned which aims to improve the health-giving qualities of garlic and related crops such as onions.

The Polytechnic currently has over 13,000 students, 6 per cent of whom are from overseas. They have numerous links with educational, research and industrial institutions through-out the world and are keen to encourage exchange projects and collaborative ventures.

CAUSE OF LATE-LIFE DIABETES

Scientists at Glasgow University, in Scotland have launched a £1 million research programme into the possible cause and effect of late-life diabetes.

Late-life diabetes occurs when the body fails to use the insulin it is producing, in contrast to juvenile diabetes where the cells cannot use glucose sugars because the body fails to produce the insulin hormone. Juvenile diabetes can be treated by straightforward insulin injections, but these are not available to sufferers who contract the disease later in life.

Prof. Miles Houslay, who is leading the five-year programme, said that late-life diabetes had been associated with a number of conditions such as obesity, but there was no simple explanation. The problem lies with the failure of the body's signalling mechanism. Prof. Houslay explained: "The insulin hormone should signal to the cell to absorb glucose sugar but this fails to happen if the messages get confused. By understanding how this happens, it will be easier to diagnose and treat late-life diabetes." But he warns: "It is like unravelling the body's telephone exchange to find out how it works."

New Products

MICROPROCESSOR BASED ISOTOPE THICKNESS GAUGE FOR NON-CONTACT THICKNESS GAUGING AND CONTROL OF ON-LINE PROCESS

Instruments Group, ECIL has been manufacturing and marketing Isotope Thickness Gauges for use in the Cold Roll Mills in the steel industry. These are manufactured in collaboration with M/s. Kugelfischer George Schafer KGaA of West Germany.

Non-contact, on-line measurement of thickness and basis weight of sheet material is the latest and most cost effective method of manufacture in which the end product meets the most stringent specifications, effects savings in raw material & energy and facilitates maintenance of consistent quality.

As an extension of this collaboration Instruments Group, ECIL is now offering on rupee payment the latest Microprocessor Based Isotope Thickness Gauge. Under this collaboration ECIL will undertake the manufacture, installation, commissioning and maintenance of these gauages.

Measuring Front End

For on line measurement at a fixed point on the sheet, like in steel cold rolling, normally a C-frame is suggested. The C-frame houses the radioisotope in its lower limb and the ion chamber detector in its upper limb. The C-frame, rugged in design, has a pneumatic or electric drive system for moving it online or off-line. The dimensions of the C-frame like measuring gap, throat depth and traverse are decided based on application and site requirements.

Where cross-profile scanning of the sheet is required, like in paper and plastics, normally an O-frame is suggested. The O-frame is a very precise mechanical structure where the radio isotope carriage on the upper arm and detector carriage on the lower arm are accurately aligned to move simultaneously and parallely to each other at all times maintaining a constant measuring gap between them. The electrical gear drive system and the pulse encoder indicate the instantaneous locating of the measuring head across the O-frame. This O-frame is designed for long, continuous and faultless operation under industrial conditions.

In rubber calenders, it is often required to measure the thickness of rubber alone before it is applied on the fabric. In case of paint or laquer coating or metallic coatings on steel sheets (wet and dry) only the coating basis weight is to be measured. In such applications, normally a backscatter measuring system is employed. Here the measuring head houses both the radioisotope and the detector behind it in one rugged housing. This is mounted directly on the calender or the coated sheet. If scanning across the sheet is required, this is achieved by a suitable drive mechanism for the backscatter gauge head on a I-beam across the calender or sheet.

Paper machines invariably require O-frame scanning gauge with a combined measuring head for basis weight, moisture and ash. The O-frame dimensions are fixed as per the paper web width.

For differential gauging, where it is required to measure basis weight at various stages of coatings, laminations or impregnations, two or more front end measuring systems, of either C-frames or O-frames, are employed as per the process and measuring requirements. Employing this basic technology, there is no limitation on the various types of gauge configurations that can be offered as per the process requirements.

UV-VISIBLE SPECTRO-PHOTOMETER

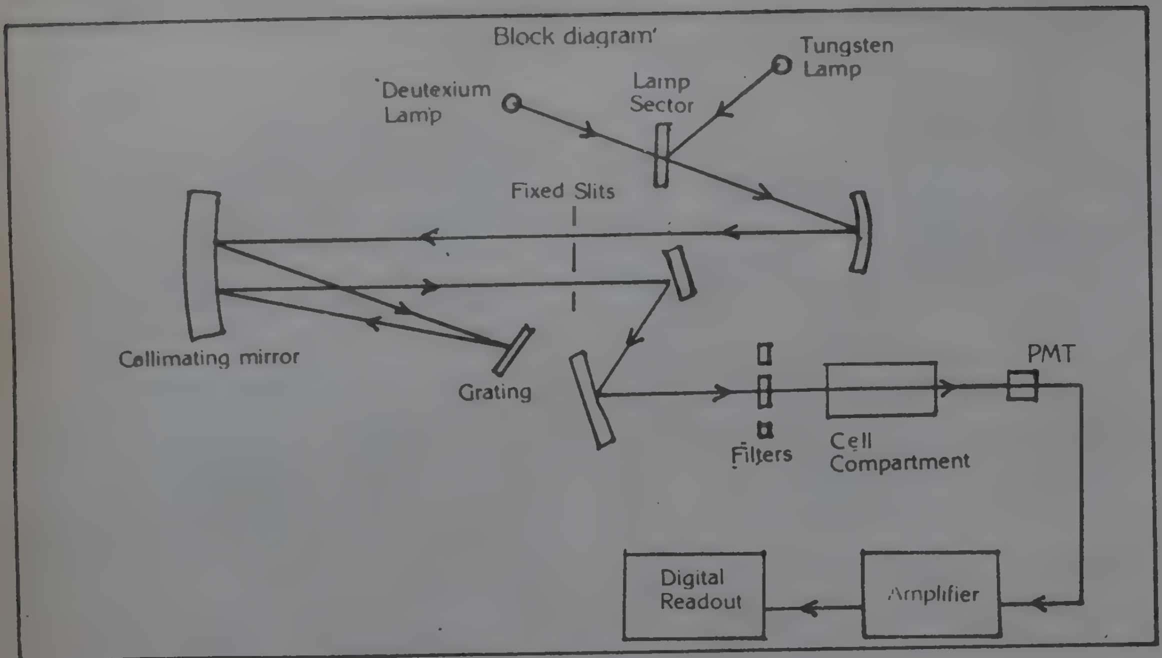
Keeping in view the market requirement for a compact, low priced UV-Visible Spectrophotometer, ECIL undertook the development of the GS5701 with indigenous know-how. This is a replacement for earlier model GS5701D which was a proven model. The GS5701 consists of a power supply for tungsten halogen/deuterium lamps and for other electronic circuitary, indicating module, precision monochromator, cell compartment and a silicon photo detector. The block diagram is given in the following page.

To meet the strigent requirements of reproducibility, sensitivity and drift free operation a precision FET input operational amplifier is used at the input stage of the instrument.

To obtain stable light out-put for continuous operation, the lamps are provided with highly stable and regulated power supply with short circuit and over voltage protection. To minimize the stray light from the monochromator, three filters of different ranges are provided in the light path. Provision is made for optical cuvettes of extended path lengths upto 50 mm to enable the analyst to measure very low concentrations. Scale expansion facility is also provided to enable the analyst to measure the desired concentration levels.

This narrow band UV-Visible Spectrophotometer finds extensive use in the analysis of vitamins, minerals, amino-acids, enzymes, hormones, steroids, alkaloids, toxicants and soil ingredients.

ECIL's UV-Visible Spectrophotometer GS5701 is a compact and precise narrow band grating spectrophotometer covering a range of 200 nm to 950nm at a fixed bandwidth of 2nm. This UV-Visible Spectrophotometer is useful



for the qualitative and quantitative analysis of organic and inorganic samples.

Principle: Absorption spectrophotometry is based on the principle that each substance has characterstic properties which determine the wave lengths of radiation that it will absorb. When the frequency of a particular wavelength of radiation coincides with this resonant frequency, the radiant energy is imparted to the substance. This phenomenon of energy transfer is referred to as absorption.

For details on ECIL's products contact: Electronics Corporationn of India Ltd., Instruments Group, ECIL (P.O.), Hyderabad 500 762.

FLP/WP LIGHTING FITTINGS & SWITCHGEARS

M/s. Flexpro a renowned name in flame-proof/weather proof/explosion-proof electrical equipments and one of the leading manufacturers in the line started activities in the year 1973. Untiring and persistent efforts, towards acquiring proficiency in manufacturing more than 450 flame-proof/weather-proof electrical equipments have also made them practically experienced, and aware of the importance of maintaining precision and utmost workmanship in all equipments manufactured by them. It is, therefore, their prime goal to manufacture flame and explosion proof electrical equipments with utmost care, caution and craftsmanship. Flexpro offers the following wide range of lighting fittings, switchgears, DB's and conduit wiring accessories.

FLP/WP Lighting Fittings: Fluorescent Tubelight Fitting, Well Glass Fitting, Hand Lamp, Floodlight, Bulkhead, Vessel Lamp, Emergency Light, Safety Torch and Dust Tight/Dust Proof Tube Light.

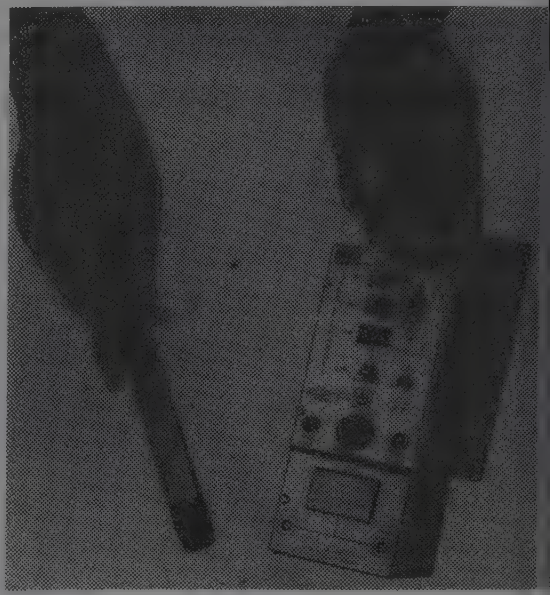
FLP/WP Switchgears: Push Button Station, D-O-L Starter, Rotary Switch, Exhaust Fan & Air Circulators, Isolator With Ammeter or Voltmeter, Switch Fuse Unit, Control Gear Box, Junction Box and Panel Board/Distribution Board.

All above items are tested and certified by CMRS-Dhanbad, and approved by CCE-Nagpur, DGFASLI-Bombay and bear ISI Mark. Flexpro also has the ability to cater to specific needs in flame and explosion-proof equipment.

For further details contact: M/s. Flexpro Electricals Pvt. Ltd., 37, G.I.D.C., Kabilpore, Navsari 396 424, Dist. Valsad, Gujarat State.

PORTABLE GAS DETECTOR

Subtronics has introduced a Portable Gas Detector which works on four Pen Cells i.e. 6 Volt D.C. and is a compact instrument with handle & three coloured dial zones: green, yellow and red. It ca be calibrated by manufacturers to rea 0-1, 1-10 & 10-100 PPM of particul gas/fumes/vapours. It has a probe cab of 2 feet but can be extended upto 10 meters. Its Gas Detector reaches to th confined places to read minute leaks joints of couplings, gas lines, flange etc. The alarm level is selectable b means of slide switch provided in fro of it. Because of low current and soli state circuitary the life of the batteri is very high.



It detects freon, L.P.G. ammoni hydrogen, hexane, benzene, toluen alcohols and many more gases and ha applications at A.C. plants, chiller unit compressors gas banks/plants, solver extraction units, chemical and fertilize plants etc. The recurring expenses othe than batteries are mostly nil and the un can be operated by an average techni cian. The battery box is behind th instrument and has a built-in piezo buzzer with facility to add externa siren.

For further details contact: Subtron ics, Kaliandas Udyog Bhavan, Unit No 147, Near Prabhadevi Post Office Bombay 400 025.

A COMPOSITE STRUCTURE FOR ANY CONSTRUCTION

A revolution in materials science ha enabled the first construction in com posite materials that could be industri alised. It was developed by a Frenc

research centre and is the outcome of reflection on the evolution of construction systems and their industrialisation. It is by mixing different technologies that its creators developed monopiece shells in composite material, with high level resistance and safety, proof against the vagaries of both time and weather.

The material used is made of vinyl or polyester, 'loaded' with mineral elements and reinforced with fibre glass.

Its advantages? The possibility of building a structure of very high mechanical resistance (100 tonnes on a ground holding of 33 m); light weight (4 tonnes for 130 m); with flexible materials that are therefore resistant to earth tremors. It is not necessary to lay a foundation, because of the highly insulating quality of the material used.

For further information contact: Groupe Impact Design, 29, rue du Faubourg-Poissoniere, 75009, Paris, France. Tel.: 42463626. (CEDUST)

BAYGARD ON THE BALL AT THE 1992 OLYMPICS

When gold, silver and bronze are at stake, even tennis balls are capable of reaching new heights. Wilson's latest development, the "Olympic Ball", has been chosen as the official ball for the Olympic tennis championships.

The "Olympic Ball" is covered with an exceptionally hard-wearing felt and — for the first time in the history of tennis — it has been treated with Baygard, a special impregnating agent made by Bayer AG.

Baygard forms a protective film around each fibre in the felt like a second skin. This considerably reduces the uptake of moisture and dirt so balls stay clean and are easier to see, even on cinder courts. And that makes life easier for spectators and television viewers as well as for the players themselves. The "Olympic Ball" naturally meets all the other demands made on modern tennis balls: it bounces evenly on all types of court and is hard-wearing. No wonder ten Europen tennis associations have already selected it as their official ball.

Wilson's latest development has been chosen as the official ball for the Olympic tennis championships. This new ball is treated with Baygard, a special impregnating agent from Bayer that forms a protective film round each fibre in the felt, thus reducing the uptake of moisture and dirt. So the ball lasts longer and remains visible, making it ideal for matches on cinder courts.

Wilson has also developed another ball, the "DTB Official" , for the German tennis federation. This ball is already used by most regional clubs in Germany and will be used at national level in the 1992 season. Like the "Olympic Ball", it is impregnated with Baygard, making it ideal for matches on cinder courts. And that means millions of amateur players will feel the benefit, too.

Tennis nalls impregnated with Baygard remain lighter than conventional balls because they take up five times less moisture. And because they are lighter they aren't so hard on the player's muscles — or his racket. What is more, they stay clean longer so they remain visible and keep clothes cleaner. As an added bonus, Baygard improves the stability and elasticity of the felt, so balls last longer and are less prone to felting.

CURLING STONE FOR THE HANDICAPPED CAN BE USED ON CARPET

Emkocell A.S. of Vejle, Denmark, and the Swedish firm of Unihoc Sport AB have jointly developed a curling stone made from polyurethanes which is intended primarily for use by handicapped people playing on a carpeted surface. The handle and upper part of the stone are made from Bayflex, while the sole is moulded in Baydur 110 —both polyurethane raw materials from Bayer AG, Leverkusen, Germany.

The polyurethanes are reaction injection moulded around a metal core. The upper sections of the curling stones are inmould coated in a variety of colours for ease of identification. The choice of semi-flexible Bayflex ensures that the stones, each of which weighs 3.9 kg, suffer no damage when they collide with each other or with the walls.

LEVASINT IN REFRIGERATION ENGINEERING COATINGS FOR EVAPORATORS

Bayer's Levasint powder coating has an outstanding property profile and new applications are continually being found for the product. As Levasint satisfies the requirements of Germany's Federal Health office recommendations for drinking water and food contact applications, it is now being used in the refrigeration sector to coat evaporators for freezers. Varying and sometimes extremely low temperatures as well as fluctuating humidity place considerable stress on coatings in this application. With its easy handling, good adhesion and durabiity, Levasint is greatly superior to other coating systems under these extreme conditions.

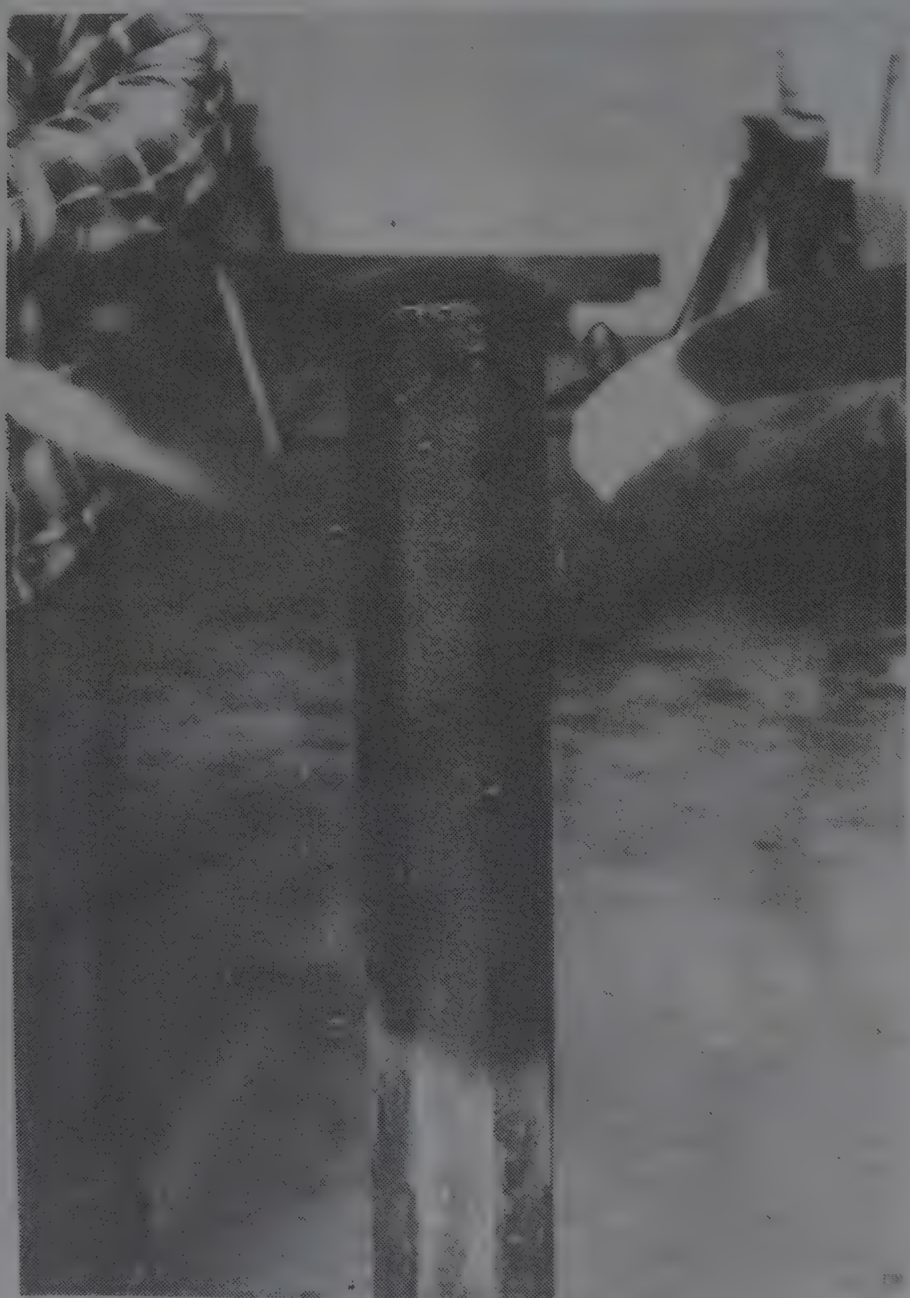
The coating process is very simple. The metal piping is heated and the powder coating then applied by dipping in a fluidized bed or by spraying. The whole operation takes just a few seconds and results in a paint film 0.3 mm thick.

Levasint coatings are characterized in particular by their excellent weather stability and resistance to chemicals, good flexibility with toughness (even at low temperatures), good electrical insulation properties and low flammability. In addition, the solvent-free powder ideally satisfies environmental requirements.

NEW APPLICATIONS FOR LEVASINT: RECYCLED PLASTIC ALSO NEEDS PROTECTION

Bayer's Levasint, a thermoplastic sintering powder, has proved ideal for the coating of recycled plastic, the base material of which is unsorted plastic from household and commercial waste. Luft GmbH of Budenheim/Maiz reprocesses the waste plastic into posts and planter elements. Depending on the composition of the waste plastic, the recycled material is an unattractive colour varying between brown-grey and anthracite. An additional problem is that small remnants of metal, which can never be completely removed from the mixed waste, tend to corrode. Coating the finished products with Levasint improves their appearance and protects them against corrosion.

Unlike many other coating systems, Levasint has very good adhesion and provides a smooth finish on the sligl porous surface of the recycled pla articles. The flame spraying proc used to apply the coating is very sim Levasint's melting point of 105-108 is the lowest of all the compara powder coatings and greatly simpli the spraying process. Levasint is av able in a wide range of colours.



Luft GmbH of Budenheim/Mainz uses unsorted waste plastic to manufacture items such as posts. The colour of the finished products is unattractive and they contain small remnants of metal which tend to corrode. Levasint, a thermoplastic sintering powder from Bayer, is applied by flame spraying to improve the appearance of the recycled plastic components and provide protection against corrosion.

The finished coating is maintenan free, durable and can be repaired *in s* should mechanical damage occur. T film thicknesses of 0.3 to 0.6 mm wh are achieved in a single application o ration are weather-stable, impa resistant and intensive to soil and s qualities which are particularly imp tant in posts, planters and traffic islan Levasint is entirely solvent-free, c tains no toxic components and does emit harmful gases during applicati

SHOCK-ABSORBING FLOORS FOR SPORTS FACILITIES

At K'92 Bayer will be showing va ious systems for producing flexible flo coatings for sports facilities. Indo sportsmen are always seeking improve their performance — high faster, further — and, whether they a top atheletes or not, depend equally the quality of the facilities. Of maj importance is a floor which works wi the sportsman. Rigid floors place a gre deal of stress on the joints, muscles ar ligaments. What is needed is a flexib alternative which helps to prevent spo injuries.

One such alternative is provided b multicoat floor systems based c Bayer's Desmodur and Desmophen ra materials. These solvent-free, two-pac polyurethane coatings are environmen friendly and satisfy the requirements c the relevant German standards. As we as providing good protection agains injury, these systems are also highl resistant to wear and abrasion.

The formulations are applied with trowel, knife or screed broad. As th

coated floor is seamless, it is easy to clean and is extremely hygienic.

Applications for these flexible PU systems extend beyond sports halls. The shock-absorbing materials can also be used for floating coats in chemical-resistant systems for containment basins. The raw materials used in this case are modified to make them so tough and flexible that they easily fill cracks and move with the substrate. This modification is achievedby adding Desmophen 1920 D, a branched polyester containing urea which yields high flexibility and excellent mechanical properties. In other cases, a two-pack system based on Desmadur VL (aromatic isocyanate) and Desmophen 1150/1155 (branched polyether/polyester) is normally used.

For further detials on Bayer's products please contact: Jagat Chemicals Ltd., Express Towers, Nariman Point, Bombay 400 021.

SPECIAL ADHESIVES

Not only do surgeons have to be skilled with their hands, they also have to be fairly inventive. They have borrowed tools, such as saws, screwdrivers, planes, drills and chisels from all kinds of trades, and moreover, have often devised their own specialised tools or new applications for existing materials from other technologies. This is how surgical "adhesives" came into being.

The adhesive properties of certain animal or plant substances have been known to man for several millenia. Then, with the arrival of the industrial era, increasingly efficient, fast and irreversible chemical adhesives were developed. Surgeons realised that such products could spare them having to use delicate and complicated stitches or ligatures, but the human organism rejected these foreign substances.

In the 60s, two matters gave hope: first, the appearance of cyanoacrylate adhesives (US) and second, research undertaken on adhesives with resorcin by a team in Toulouse, France.

The former was used on the battlefields in Vietnam. Anyone who has used it knows well that the tiniest drop of this very liquid glue almost immediately bonds careless fingers together. So it seemed the ideal thing for closing up any wound in an emergency, thereby forming an airtight and watertight dressing, keeping the wound free of dirt before surgical treatment was possible in a hospital. But, when attempts were made to bond wounds deep in the body, they led to more or less long term complications and their use was thus limited.

With this experience, the researchers in Toulouse set off on a different tack, but despite long and promising trials on animals, the results remained inconclusive.

Research everywhere in the world then explored the area of biology. As early as the beginning of this century, it had been noticed that fibrinogen, which is part of the coagulation system in human blood plasma, could, in certain circumstances, bring about adhesion between tissues (pneumothorax, peritonitis and in surgery).

The idea was taken up, studied, analysed, confirmed and finally carried out on a practical level by Bio-Transfusion and by the French National Blood Transfusioin Centre which have marketed their products.

A leap forward

This adhesive comes in two separate syringes, just like the ones that come in two tubes in "do-it-yourself" stores. One of them contains the different freeze-dried elements causing human haemostasia (blood-cotting) and the other containing thrombine, which is the other element used in blood-clotting. Combining the two products causes the formation of fibrinogen. An important fact is that this adhesive, made of human proteins, does not present any compatibility problems.

Its uses are obvious: in all cases when stiches need to be reinforced, when complete air or water-tightness needs to be ensured, or, more simply, every time bleeding has to be stemmed. Its field of application is thus vast and there are few areas of surgery in which it does not contrbute an extra measure of security.

It is part of the equipment used by ear, nose and throat surgeons, plastic surgeons (for skin-grafts, in the application of strips of skin, and for invisible cars), bone surgeons (for bonding difficult fractures and attaching tendons), for treating seriously burned patients, etc. Neuro-surgeons use it, each time they have probems sewing up the meninges, but surgeons of the digestive tube are the keenest, when it comes to stitching the intestine, or for use in the case of anastomosis in colorectal surgery where there is a very high risk of post-operational rupture.

The biggest beneficiary is, first of all, surgery of the liver, which is very rich in tiny blood-vessels and in which it is amost impossible to stop bleeding. Whaever care is taken, bleeding is inevitable, which compromises the immediate and distant future of people who have been operated on. Surgical adhesive has removed this great stumbling-block, enabling this kind of surgery to make a tremendous leap forward and become commonplace, while the success of liver transplants increases month by month.

There is thus a huge potential market and annual production amounts to 100 litres, although it is an expensive product. A millilitre costs in France, the equivalent of Rs. 20 to 2,500. An ENT operation needs about 0.5 ml, while at least 5 ml are required for a liver operation. However, it is clearly a product of undeniable benefit and for which, as

is often the case, demand will bring down the price. Research is continuing in this area and new "ready-to-use" adhesive, not requiring any mixing, should shortly be coming out.

For further information, contact: Centre National de Transfusion Sanguine, 6, Rue Alexandre Cabanel, 75739, Paris Cedex 15, France. (Tel: 43067000; Tlx: 250793; Fax: 43067000. (CEDUST)

LIGHT MEASUREMENT INSTRUMENTATION FEATURED IN NEW 28-PAGE CATALOG

A new catalog describing a wide range of instruments that are user programmable and can be customized to OEM requirements for applications over a 20 decade range is being offered by International Light Inc. of Newburyport, Massachusets, U.S.A.

The International Light Catalog describes a complete line of radiometers, photometers, spectroradiometers, detectors, and accessories which can be configured into over 1,000 different user programmable systems. Covering measurements in the UV, visible, and near infrared spectral regions, system descriptions along with spectral, and technical information is supplied.

Providing a table of contents organized by types of instruments, detectors, input optics, and accessories, the comprehensive 28-page International Light Catalog has a section dedicated to specific applications which include: photometric, radiometric, UV curing, photoresist, UV hazard, phototherapy, germicidal/UVC, laser power, and ozone depletion/erythermal.

The International Light catalog is available free from International Light Inc., 17, Graf Road, Newburyport, MA 01950-4092, U.S.A.

STEELY PLASTIC BOLTS

A fibre reinforced plastic bolt stronger than steel but far more friendly to its working environment has been developed for use as a roof and wall stabiliser in underground tunnels. It also has potential for use in the aerospace industry, because of its lightness, and the chemical industry, due to its corrosion-resistance properties according to a report in the *Australian Science and Technology Newsletter.*

The Australian mining industry uses about six million steel bolts a year and requires six lakh dowels. While the plastic product is more expensive to install, it shears off clearly when strack by coal-cutting equipment, a common occurrence. The plastic bolt quickly pays for itself through reduced machinery damager and absence of coal pollution. Another advantage is that unlike its steel counterpart, the plastic bolt does not have to be removed from the wall or roof, thus eliminating what can be a dangerous operation.

The developer said that coal mining in Australia was highly automated. "They use huge machines to cut the coal out". If the cutter hits the steel bolt a lot of damage results. Despite the use of electromagnets on conveyor systems steel fragments often got through to create problems in the processing stage.

"One of the problems with the product is the perception that platic is not as strong as steel. With composite fibre-plastic this is not so. The bolt shank has a tensile strength of 36 tonnes, the thread will take 14 tonnes and a thread-nut combination upto 20 tonnes."

SLICK PAINT GIVES GRAFFITI THE BRUSHOFF

An american company has developed a non-stick coating based on molecules akin to soap. The material is the first which can be sprayed or brushed on like water-based paints and could be used to combat graffiti, says a report in *New Scientist.*

Coatings such as Teflon need high temperatures to apply them or solvents

which attack paints and plaastics. Other coatings demand hazardous organic solvents, says Donald Schmidt, a scientist at Dow Chemical in Midland, Michigan, U.S. who developed the new material. The water-soluble molecules include reactive ionic and fluoroalkyl groups which give them soap-like properties. In soap the molecules would attach themselves to dirt but Dow's molecules attach themselves to most common surfaces. A second water-soluble compound in the solutions reacts with the first when dried or heated, forming the hard non-stick coating.

The company tested the coatings by applying them to car bumpers where they "shed insects" soil and road tar dramatically better than conventional automobile plants. The coatings showed "good stability" in sunlight and neither permanent marker inks nor spray paints based on organic solvents stick to them.

POTENT POISON

For the large numbers of cancer patients who hang onto every word of possible new cures, it has often seemed as though one step forward also goes two steps back.

But there may be hope this time round in a natural poison formed from a certain type of soil bacteria called **enediynes,** that is found to kill tumour cells. The flaw in the find is that this molecular equivalent of a Trojan horse, also destroys normal cells. The powerful enediynes enter cells and home in on their genes. When activated by a chemical signal, they turn deadly — destroying both the genes and the cells, both good and bad.

The ray of hope is that scientists in a US laboratory have succeeded in fashioning a synthetic enediyne that targets only tumours. The man-made enediyne appears more potenti in killing leukemia and other cancers than the available drugs. And it has scientists guessing — they don't know why or how. What they do know, however, is that enediynes will be important in the long-drawn battle against cancer.

Acrylamide — Why Aqueous Monomer?

NORBERTO MANCUSO and SUNIL SINGHAL

Indo-American Chemicals Pvt. Ltd., New Delhi have pioneered the manufacture of acrylamide in the country. The product, imported in large quantities, is now available indigenously in the form an aqueous solution. In contrast most imports of acrylamide into the country is of the solid variety. As this paper tells us most of the acrylamide used locally in Japan is the aqueous solution grade; the solid grade being reserved for exports.

This paper was presented at a meeting organised by M/s. Indo-American Chemicals Pvt. Ltd. and M/s. Sankalp Chemicals Pvt. Ltd., their distributors.

Prof. E.H. Daruwalla, Former Director, Bombay University Department of Chemical Technology presided over the meeting. According to him acrylamide products would find greater application in the oil industry, apart from the textile industry which today accounted for 85% of demand.

Mr. Mehul Ajmera, Director, Sankalp Chemicals welcomed the gathering. **Mr. Sunil Singhal,** Managing Director, Indo-American Chemicals gave a brief account of his company and the advantages of using acrylamide in aqueous form.

The following is the text of the talk presented by Mr. Norberto Mancuso at the meeting.

India had no domestic acrylamide manufacture till Indo American Chemicals stated production in 1991. All the acrylamide was imported and almost all of it came from two manufacturers in Japan namely, Mitsubishi and Mitsui. Obviously, powder material was imported because of the freight involved and the practise has gone on for the past so many years.

Accordingly, all the acrylamide users in the country have got accustomed to using powder material and are not aware that, intérnational the aqueous monomer is almost the universally accepted form of acrylamide.

Out of the total world production of acrylamide, estimated at 270,000 MT, more than 92% gets manufactured as aqueous monomer while only 8% is converted into the power form. For the two Japanese companies who have been traditional suppliers to India viz. Mitsubishi and Mitsui the statistics shows that out of their total acrylamide production more than 85% is manufactured as the aqueous monomer while less than 15% is converted into the powder form, which is mainly for exports. Thus, almost the entire domestic consumption of acrylamide in Japan is of the aqueous monomer.

Why does the entire world consume acrylamide aqueous monomer almost exclusively ?

The answer lies in the fact that acrylamide is a severe neurotoxin and a cumulative toxicological hazard. It is toxic by ingestion, inhalation, dust and by skin absorption. To quote from the Mitsubishi catalogue, "Acrylamide monomer can be a serious health hazard especialy to the nervous system".

Kirk & Othmer Encyclopaedia says, "Dry acrylamide presents hazards primarily from dermal contact and inhalation of dust and vapour. The most significant problem occurs during the course of emptying bags."

Given below is a brief review of the recent technical literature on the effects of acrylamide on the non-human and human systems.

Toxic effects — non-human

Acrylamide causes predominantly peripheral neuropathy in most experimental animals, including non-human primates. The effect is produced in most animal species with repeated doses of 10-50 mg/kg bw (body weight) per day, irrespective of the route of administration, including dermal application. (Kaplen & Murphy, 1972, Greirguis, 1983).

The visual system is also found to be a target of acrylamide. Impairments of visual function were observed in female macaque monkeys treated with 10 mg/kg body weight per day for five days a week for six to ten weeks (Merigan et al, 1982).

Male mice receiving doses of 35 mg/kg body weight twice weekly for eight weeks developed testicular atrophy. Testicular atrophy was also observed in rats. (Hashimoto et al, 1981, Burek et al, 1980).

Other subchronic effects of acrylamide, probably secondary to nerve degeneration, include atrophy of skeletal muscles and distension of the urinary bladder in rats after administration of 20 mg/kg body weight per day for three months. (Burek et al, 1980).

Toxic effects — Human

Acrylamide is a primary skin and respiratory irritant and neurotoxin with an affinity for the peripheral ends of the Spinal nerves in the extremities. Acrylamide intoxication in the workplace is due mainly to repetitive, daily, local dermal contact (Spencer & Schaumbur, 1975). It induces axonal neuropathy characterized by dying-back degeneration. (Spencer et al, 1978).

Cyanamid literature says "Airborne acrylamide is readily absorbed through the lung and overexposure will produce signs and symptoms of neurotoxicity".

Table I gives the main reports on the toxic effects of acrylamide on humans.

The clinical signs of intoxication with acrylamide have been summarized (Hashimoto, 1980) as follows:

Generalised fatigue, foot weakness, sensory charges, including numbness of the limbs and tingling of the fingers, as well as implairment of the fine motor activities and, later motor paralysis. In addition to signs of peripheral neuropathy, some affected individuals develop signs of central nervous system damage such as tremor, an atoxic gait or mild organic mental syndrome.

Exposure Limits

Occupational exposure limits for acrylamide have been set by regulation or recommended guidelines in 13 countries, as given in Table II. As can be seen, some of the guidelines are as recent as 1985. It is worth observing that Yugoslavia was the first country to set official guidelines as far back as 1971.

The relevance of the above data can be estimated by taking an example of a typical Indian factory of, say, dimensions 10m x 10m x 5 m = 500m^3.

As per the limits in Table II, to keep within the 0.3 mg/m^3 limit, this factory should not have acrylamide concentrations higher than 500 m^3 x 0.3 mg/m^3 = 150 mg at any given time.

Now, consider that one bag of imported acrylamide powder is 25 kg and, when cut and opened manually, will give rise to some powder flying off and staying in the air within the factory.

Even if we consider an absurdly low figure of 0.1% of the powder acrylamide flying off, the amount present in the air will be 25000 mg or 25000 mg/500m^3 = 50 mg/m^3. This figure is 170 times than the permitted limit! You can well imagine the figure when more than one bag is being used.

Table - I
REPORTS ON TOXIC EFFECTS OF ACRYLAMIDE ON HUMANS

Reference	Toxicity (acute, chronic)
Auld & Bedwell	Neurotoxic effects
Garland & Patterson	Peripheral neuropathy
Morviller	Light intoxication, dermal desquamation, hyperhidrosis, weight loss, signs of polyneuritis and ataxia, ocular irritation
Graveleau et al	Desquamations (hands) hyperhidrosis (hands and feet) paraesthesias, ataxia
Takahashi et al	Absence of deep reflexes, decreased sensory functions, ataxia and gastrointestinal symptoms
Cavigneaux & Cabasson	Paraesthesias, sensomotor defects, polyneuritis
Igisu et al	Encephaloneuropathy (including mental disturbances) coughing, rhinorrhoea, ataxia, reduced sensory conduction velocity
Davenport et al	Peripheral neuropathyl ataxia, hyperhidrosis (hand and feet)
Kesson et al	Hyperhidrosis, desquamation, sensorial disturbances; residual neurological problems persisted in the two eldest persons
Mapp et al	Dermal erythema and desquamations, peripheral neuropathy, encephaloneurophathy, dyspnoea, impotence

Table II
NATIONAL OCCUPATIONAL EXPOSURE LIMITS FOR ACRYLAMIDE

Country	Year	Concentration (mg/m^3)	Interpretation
Australia	1978	0.3	TWA
Belgium	1978	0.3	TWA
Finland	1981	0.3	TWA
France	1984	0.3	TWA
Germany, Federal Rep. of	1984	0.3	TWA
Italy	1978	0.3	TWA
Japan	1984	0.3	TWA
The Netherlands	1978	0.3	TWA
Sweden	1984	0.3	TWA
Switzerland	1978	0.3	TWA
UK	1985	0.3	TWA
		0.6	STEL
USA - ACGIH	1984	0.3	TWA
NIOSH	1976	0.6	STEL
OSHA	1983	0.3*	TWA
Yugoslavia	1971	0.3	Ceiling

* Revised to 0.03 mg/m^3 in 1989
ACGIH - American Conference of Government Industrial Hygienists
NIOSH - National Institute of Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
TWA - Time-weighted average
STEL - Short-term exposure limit

Also, for the workers in the immediate vicinity of the powder acrylamide bags being opened and dropped into the reactor the exposure will be far, far higher. Aqueous monomer is, therefore, the preferred form of acrylamide.

In India, robotised and fully automatic sophisticated dust proof handling systems for cutting, opening and pre-weighted dispensing of powder acrylamide are not practical because of extremely high costs and small users who use a few bags a day.

Aqueous monomer is therefore, the preferred form because it is ideal for Indian conditions where manual handling is the norm and the use of gloves, breathing masks, special clothing, showering after work are not common practises.

Table III
Specifications and Properties of aqueous acrylamide

Specifications	
Assay	40 ± 0.5%
pH, as is, @ 25°C	5.5 - 6.5
Colour	Transparent, Colourless to pale straw
Odour	Odourless
Properties	
Refractive Index, @ 35°C	1.396 - 1.398
Viscosity, @ 25°C	1.9 -2.2 centipoise
Vapour Pressure, @ 25°C	20 mm Hg
Flammability	None
Solubility in Water	Soluble, in all proportions

Increasing awareness of safety in the workplace, more commitment towards social responsibility, and environmental protection make it essential that Indian users of acrylamide change from the powder form to the aqueous monomer now that it is readily available within the country.

Technology Hurdles in Indian Chemical Industries

N.S. VENKATARAMAN
M-60/1, IV Cross Street, Besant Nagar, Madras 600 090.

In sheer desperation, one of the chemical project entrepreneurs seeking to identify and promote diversification project said recently that "In India project ideas are available in plenty; project consultants are available in adequate numbers; but only proven and worthy technologies are lacking. Any person involved in the field of chemical industries would only know that such statement is correct and true. It appears that the future of Indian Chemical Industries is now facing a near stagnant level of growth due to constraints in the availability of technical knowhow and hurdles in the technology front.

A careful investigation of the problems would only indicate the fact there can be no short term or simple solutions to the problems of technology hurdles in Indian chemical Industries. A detailed analysis of the sick and nearly sick chemical industries in India, particularly in the small and medium scale sector, would indicate the fact that more than 60% of such industries in the country face the problems of sickness only due to the technology constraints and inadequate technical knowhow provided to them. There may be other causes for sickness also like inadequate capability of the project promoters, market constraints, working capital problems, delays in project implementation etc. But, the basic underlying problem of technology would be more evident in these units, as a result of which problems can not be sorted out.

One obvious reason for our inability to overcome the technology hurdle is the inadequate commitment, efforts and investments in the field of Research and Development, to optimise the process, cost and quality parameters in producing chemical products. Though a large number of R & D Institutions exist in the country in the private and public sector and high level of lip service is being paid to the importance of indigenous R & D efforts to provide self-reliance to national chemical industries, the actual growth and achievement in the R & D field has been inadequate and disappointing. A number of R & D bodies recognised by the Department of Science and Technology, which swell the number of R & D Institutions in the country, do not have any worthwhile developments or significant achievements to show even after several years of existence. It can also be seen that number of R & D Labs, particularly those attached by the Industrial units, function more as quality control and trouble shooting centres rather than carrying out 100% R & D activities like development of innovation and appropriate chemical processes.

The Indian Chemical project entrepreneurs, industrial managers and scientists have generally considerable craze to publicise their achievements, if any. Even the Indian press, both technical and non-technical, always look forward to the opportunities to highlight the performance and achievements of Indian scientists and industrial units and they have been very generous to the Indian scientific community. Even comparatively insignificant contribution of the Indian industrial units like spending a few lakhs of rupees on community development projects and national welfare schemes are often published by the Indian press in a big way. Inspite of such conditions of publicity galore, we rarely find news about high level of significant achievements by the Indian chemical industries in the technology front. Even most of the Indian technology journals, who maintain columns to write about the international developments in the field of chemical industries and chemical technology, do not find the need to maintain any regular column to hightlight the Indian achievements, mainly due to the paucity of news. If one were to study the Annual Reports and Balance Sheets of Indian chemical industries, one would rarely find any mention of spectacular R & D achievements in their organisations. The report would only talk about the technoloy acquisition from abroad.

The Indian Chemical industries still largely depend upon buying the technologies, rather than developing the technologies for the chemical projects. Whereas the large units readily import technologies from abroad, medium and small units seeking to buy technologies from the Indian sources like R & D bodies and project consultancy set ups, often land themselves in serious problems due to inadequate technologies or obsolete nature of technology. Several Indian R & D centres and project consultancy set ups themself appear to be inadequate to transfer chemical technologies in a competent manner. It is sad to find consultancy set-ups seeking to transfer technologies, when they not even have a test tube in their possession.

Technology acquisition is likely to pose more serious hurdle for the Indian chemical industries in the coming years than hitherto, since the Indian market has become more competitive. Particularly due to low purchasing power of Indian chemical industries it appears that further growth of Indian chemical industries can take place, only by entering the export market in a big way, which would not be possible in the

absence of strong indigenous R & D strength. As the technology acquisition from abroad often becomes costly and medium and small units cannot afford such import of technologies, they appear to have no alternative other than developing indigenous technologies in a big way to overcome the technolgy hurdles.

The blame for the present situation faced by the Indian Chemial Industries have to be shared by the Indian Chemical project entrepreneurs, managers of existing chemicals units and the scientists/technologists in the country. T present situation has arisen, since we have opted for the e way of buying technologies, paying indequate efforts developing adequate technical knowhow for the projects sustained study and hardwork. Great opportunities rem unexploited by Indian chemical industries due to the abse of technical knowhow. It appears that the future growth Indian Chemical Industries would really centre around R & D Institutions, pilot plant study units and techn information centres in the country.

Energy Efficiency and Environment Protection

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Efforts of most of the process engineers have been in improving the plant efficiency and safety in chemical plants. Most of the efforts with respect to raw materials/energy conservation and safety were confined to the battery limits of the plant. With energy and water becoming expensive as well as scarce, some attention is being received by the utility equipments of late. Often the boilers and other utility equipments are over-designed to take care of the expansion/diversification to be implemented at a later stage. Once selected and installed, these equipments are often in the hands of able operators to ensure their smooth functioning. The process engineers do not review these equipments periodically to ensure their optimum operation especially with respect to energy consumption and emission levels.

In the boilers, fired heaters and furnaces air is used alongwith fuel for combustion. The proportion of air to fuel plays a vital role in the overall combustion efficiency and also in the composition of the emissions from stacks. There is interrelationship between fuel efficiency and emission levels of pollutants like NO_x and CO. The interaction of both aspects of the combustion process to maximize fuel efficiency while ensuring environmental compliance should be taken into consideration. The amount of excess air plays a critical role in determining the fuel efficiency, by controlling the volume, temperature and specific heat of the flue gas. The parabolic functional relationship between levels of NO_x as well as CO emissions and excess air ratio should be clearly understood and suitably determined for efficient operation.

With 79% of air being nitrogen, it may be appreciated that this inert gas does not play any role in combustion. On the other hand, nitrogen necessitates large size air blowers and air ducts, large heat transfer surface area and large diameter of boiler stacks. Nitrogen also carries away energy since it gets heated alongwith flue gases. If the temperature during combustion exceeds 1540°C, nitrogen gets converted to NO_x which adds to pollutants in the atmosphere. However, temperatures lower than this level cuts the formation of NO_x substantially. Considering these aspects and also the recent developments in pressure swing adsorption (PSA) technique whereby air rich in oxygen could be produced at a relatively low cost, it is worth looking into the use of air rich in oxygen for the boilers instead of atmospheric air. This is likely to result into better economics by way of better fuel efficiency alongwith cleaner environment. There are some industries which require inert gas in the form of nitrogen for certain operations and use PSA systems for generating the same. The air rich in oxygen from these systems is normally let off into atmosphere. This may be an environment friendly step but it could prove economical if it is fed to boilers either as primary air or as secondary air. It is hoped that this aspect of better fuel combustion, resulting into savings of energy as well as cleaner environment receives attention of the industries.

Lot of concern is being expressed on the green house effect of carbon dioxide being let into atmosphere from various activities including power plants, industrial furnaces and boilers and fermentation processes including distilleries. On the other hand, for various processes including for the production of soda ash, large quantities of carbon dioxide are generated using limestone and energy. For carbonated beverages also carbon dioxide is generated from limestone and energy.

It may not be possible to reduce the emission of carbon dioxide from various industrial activities but we may aim at stopping production of carbon dioxide. Further, the focus should be on tonnage of carbon dioxide emission rather than its content in total emissions. We may also attempt at a policy of locating large scale carbon dioxide users closer to the carbon dioxide emission sources. For example, soda ash plant may be located near a power plant. Gas based ammonia plants are not able to meet the total requirement of carbon dioxide for their urea plant. Shortfall of carbon dioxide could be supplemented from boiler stacks. Carbon dioxide generated during the fermentation process in distilleries should not be allowed to be let off into the atmosphere and should be compulsorily recovered for usage in beverages and other applications. It is likely that cost of recovery and purification of stack gases exceeds that of producing carbon dioxide but this cost may be justified from the energy and ecological considerations. An attempt of recovery of carbon dioxide from stacks serves the dual purpose of energy savings and cleaner environment.

New Biodegradable Preservative for Leather*

H. J. ROTHER, BAYER AG

Preservatives are indispensable in the leather industry for preventing damage and losses caused by mould fungi and bacteria. Wet blues, pickled pelts and vegetable-tanned leather are particularly susceptible to mould attack, while raw hides, salted or dried, have to be protected against bacteria during storage and in the soak. However, bacteria may also multiply on wet blues and cause dislocation. Consequently, products with both fungicidal and bactericidal effects are required to ensure that leather is adequately protected.

Combination of phenolic active ingredients free of pentachlorophenol was specially developed for the leather industry and possesses all the properties expected of a modern leather preservative; it has a broad spectrum of a modern leather preservative; it has a broad spectrum of fungicidal and bactericidal effectiveness, good bio-degradability and low toxicity, is simple to handle and meter and is compatible with other auxiliaries used in the leather industry.

Application

Combination of phenolic active ingredients free of pentachlorophenol is liquid and freely miscible with water, giving a clear solution. It is generally diluted with two to five parts of water before use. In the preservation of wet blues, good results are obtained if combination of phenolic active ingredients free of pentachlorophenol is added to the pickle a few minutes after the addition of salt. The usual acid addition follows after a running time of approximately 10 minutes.

If the pickle float is drained off, combination of phenolic active ingredients free of pentachlorophenol should be added at the start of the chrome tannage. Combination of phenolic active ingredients free of pentachlorophenol gives long-lasting protection, as its active ingredients have good chemical stability and are virtually non-volatile, which means that they remain fully effective in the leather. When working out how much preservative to add, the climatic conditions, storage time and the susceptibility of the wet blues to microbial attack must be taken into consideration. If necessary, *in situ* trials should be carried out to determine the optimum addition.

Effectiveness

Combination of phenolic active ingredients free of pentachlorophenol has a broad and well-balanced spectrum of fungicidal and bactericidal effectiveness. This can be seen from the following table, which gives the minimum inhibitory concentrations (MIC) in nutrient agar.

Test Organisms	MIC in mg/l combination of phenolic active ingredients free of pentachlorophenol
Escherichia coli	500
Staphylococcus aureus	500
Bacteria isolated from putrefied wet blue	450
Alternaria tenius	200
Aspergillus niger	200
Aureobasidium pullulans	150
Chaetomium globosum	100
Penicillium glaucum	200
Rhizopus nigricans	200
Trichoderma viride	200

Biodegradability

Combination of phenolic active ingredients free of pentachlorophenol contains a combination of two microbicides whose biodegradability has been studied. The active ingredients are p-chloro-m-cresol (CMC) and o-phenylphenol (OPP). Both compounds are completely biodegradable (W. Paulus, H. Genth, Biodeterioration 5 (1983), edited by T.A. Oxley and S. Barry, John Wiley and Sons Ltd.). For the purpose of these tests, 50 ppm CMC and 100 ppm OPP were added to the activated sludge from a sewage treatment plant. Both active ingredients were biodegraded after only a few days. Combination of phenolic active ingredients free of pentachlorophenol has the same good biodegradability.

The degradation performance of biological sewage treatment plants is not impaired by combination of phenolic active ingredients free of pentachlorophenol in concentrations upto 100 mg/l. This concentration is not exceeded with normal additions of combination of phenolic active ingredients free of pentachlorophenol. No more than approximately 0.01-0.02% combination of phenolic active ingredients free of pentachlorophenol was found in the residual floats after chrome tannage, and the residual floats do not go into the sewage treatment plant in concentrated form, but are diluted to between 1/10 and 1/50 of their original concentration with other effluent.

The effluent then contains no more than 0.002-0.002% combination of phenolic active ingredients; free of pentachlorophenol, corresponding to 2-20 mg/l. There is therefore

* Paper presented at the 27th Leather Research Industry get-together organised by the Central Leather Research Institute in January 1991.

no risk of combination of phenolic active ingredients free of pentachlorophenol residue in the effluent causing a breakdown of the sewage treatment plant.

Survey of applications and advantages

Applications

Raw hides
Dried hides
Soaking of raw hides
Pickled pelts
Chrome leather, wet blues
Vegetable tannage
Finished leather (in the fatliquor)
Pigment finishes, top coats.

Advantages

* broad spectrum of fungicidal and bactericidal effectiven
* Free of pentachlorophenol
* completely biodgradable
* degradation performance of biological sewage treatm plants is not impaired by combination of phenolic acti ingredients free of pentachlorophenol in concentratio upto 100 mg/l.
* low toxicity : LD_{50} 2,700 mg/kg rat
* does not have a sensitizing effect
* liquid, low setting point (-28°C) high flashpoint (> 100°C)
* freely miscible with water giving a clear solution.

New Developments in Rubber Technologies

PROGRESS IN RRIM RESEARCH

In the 1990 Annual Report of the Rubber Research Institute of Malaysia (RRIM), *Dr. Abdul Aziz bin Sheikh Abdul Kadir*, the Director, reports on the progress in the Institute's wide-ranging scientific and advisory activities.

In the field of tapping and exploitation, Dr. Aziz reports that research programmes aimed at overcoming the problems of high labour content in the tapping and collection of rubber combined with the right labour market in many parts of the country have finally begun to show promising results. The use of puncture tapping on a weekly or monthly basis to give higher yields than conventional tapping has been shown to be feasible using techniques of stimulation which give prolonged flow times of up to 60 hours from a single puncture. The development of an "auto-punch' to complement this prolonged flow from a single puncture will be the ultimate solution and will enable the rubber industry to reduce the labour content in tapping and collection operations drastically.

The RRIM made a number of advances during 1990 in the development and propagation of new clones, disease prevention, effective fertilisation, application of rainguards and treatments to overcome the problem of tree dryness. The use of young buddings — already widely accepted for its savings in replanting costs and improved productivity — was made even more attractive through studies on manuring, where the use of an alternative fertiliser was shown to be equally effective at some 20 per cent of the cost of the current fertiliser used.

Most of the newer clones in the ongoing promotion plot and large scale clone trials of the RRIM 900 series continued to out-perform the control RRIM 600 clone during 1990. Supply of polybag plants and budsticks of Class II and III clones to the organised smallholding sector was stepped up and the Rubber Industry Smallholders' Development Authority (RISDA), in particular, expanded their central source bush nurseries.

Integrated farming is one of the strategies of the RRIM for enhancing the income of smallholders. Over the years, animal husbandry projects on the rearing of sheep, poultry, ducks, honey bees and quails have been set up and these have continued to be monitored. Intercrops/cash crops have also been popular with smalholders and these projects have proved useful in providing effective guidance on selection of crops, marketing of produce and the interactive effects of the rubber trees. A pioneer project comprising 30ha of rubber as a forest species at planting densities of up to 100 trees/ha was established at the Gemas Forest Reserve during 1990. The popularity of rubber wood has enhanced the importance of this pioneer project and more such trials are to be initiated.

In the processing of rubbers several interesting developments were made available to the industry. One of these is the production of CV 60 from low viscosity rubbers by the use of a suitable chemical treatment in a prebreaker. The other concerns the marketability of skim rubbers, and has a direct effect on the economies of latex concentrate production. By the addition of a common chemical used in rubber product manufacture, the time required for the coagulum of skim rubber to become firm enough for processing has been reduced: acceptable technological properties are obtained. The Institute now has a number of available solutions to the problem of nitrosamines in latex products caused by the use of normal accelerators. One is to use vulcanisation based on ZMBT, which gives a reasonably fast rate of vulcanisation: any nitrosamines produced are reported to be non-carcinogenic.

While the effort on ENR production has been scaled-down at the RRIM, greater attention in 1990 was devoted to the newer types of modified rubbers. The techniques for preparation of liquid natural rubber (LNR) and liquid epoxidized natural rubber (LENR) were refined and suitable driers for preparation of pilot scale quantities of these materials were identified. The RRIM played an important role in the UNIDO project on precured truck tyre retreads and in 1990 concluded the first phase of testing 64 tyres of different compounds under actual operating conditions by different fleet operators. These confirmed earlier laboratory findings that the blends of natural and synthetic rubbers are superior to the all-synthetic blends.

The introduction and implementation of the ISO 9000 series of standards (very closely allied to Good Manufacturing Practices advocated by the US in the manufacture of medical equipment such as gloves) was promoted by the RRIM in 1990 with seminars and campaigns. They also assisted in the preparation of quality manuals, standard operating procedures and in the auditing for quality systems of some companies. During 1990, the RRIM continued to provide advisory and information services to extend the benefits of research and development to all sectors of the rubber industry and especially for the modernisation of the smallholder sector. The Advisory Services Division of the RRIM paid particular attention and gave full support to the various national and regional transfer of technology committees and in the specific committees establised with organisations such as the Federal Land and Development Authority (FELDA) and the Federal Land Consolidation and Rehabilitation Authority (FELCRA).

Training and refresher courses on nursery management, agronomic practices, disease and pest control, tapping and processing were held and two special three-month courses on all aspects of rubber planting and processing were held for RISDA officers to facilitate the technology dissemination process. The wide range of testing and other services (inspections, instrument servicing) provided to the industry by the soil and foliar unit, the Analytical Chemistry Division, the Specifications and Quality Control Division and the Physical Testing Laboratory were maintained at a high and efficient level during 1990.

NITROSAMINES STUDY AVAILABLE FROM RUBBER CONSULTANTS

Rubber Consultants is now offering its multi-client study 'Nitrosamines and Rubber Formulations. Commercial accelerator systems: effect on nitrosamine levels and vulcanisate properties' to post-completion subscribers. The study looks at the generation of nitrosamines from commonly-used accelerator systems containing secondary amine groups, and assesses the usefulness of alternative systems designed to give nitrosamine-free vulcanisates.

The study consists of two parts. The first is a systematic study of nitrosamine and nitrosatable amine levels of rubbers and compounding ingredients in simple natural rubber vulcanizates, using both the FDA and BGA nitrosamine determination procedures. A total of 37 simple formulations are examined. The results show that despite precautions taken, occasional trivial levels of 1-2 ppb nitrosamines are detected in some vulcanisates expected to be nitrosamine-free. However, many ingredients may be used to prepare nitrosamine-free vulcanisates.

In the major part of the study, 54 formulations suitable for applications ranging from baby bottle teats to passenger tyre treads are examined. Vulcanisation systems employed include conventional sulphur, semi-efficient vulcanising (semi-EV), EV, post-vulcanisation stabilised and equilibrium cure systems. Particular attention is paid to EV systems, which use high levels of accelerators, and 17 formulations of this type are included. For each formulation the nitrosamine levels in the vulcanisates are measured under carefully controlled conditions. Laboratory-scale mixes are used to determine rheological behaviour and vulcanisate properties, including tension fatigue, heat build-up and tear strength. The effect of changing the polymer to nitrite-free SBR is also investigated, and some evidence obtained that there are differences in nitrosamine levels.

The study concludes that, in all the cases studied, it is possible to design formulations giving essentially nitrosamine-free vulcanisates. Thirty-two materials which do not generate nitrosamines are listed. The materials recently develop to give low-nitrosamine vulcanisates are particularly usef Calculation of nitrosamine yields shows that, althou extremely low, they are sufficient to give significant nit samine levles from accelerators used at 0.2 parts phr. Leg lation, some of which is already in force, will affect b materials suppliers and rubber manufacturers, with suppli required to show that their products are free from nitro mines and rubber manufacturers having to devise formu tions to meet regulatory limits on nitrosamines and also ens that working environments are not contaminated.

The data provided on physical properties for this wi range of formulations should enable manufacturers to desi nitrosamine-free vulcanisates to meet particular specificatio It also provides an independent assessment of several ma rials produced by rubber chemical manufacturers to gi nitrosamine-free vulcanisates. The study, which includes review of the current legislation on nitrosamines and assessment of future legislative trends, is available comple at a price of £10,000, or in parts dealing with specific fo mulations types at prices subject to negotiation.

For further details contact: Dr. B.K. Tidd, Manager of Co sultancy, Rubber Consultants, Brickendanbury, Hertford, S 13 8NL.

ONLINE PRINTING TECHNIQUE FOR GLOVE IDENTIFICATION

There has always been a requirement in the medical fiel for product quality control; production control requiremen for drugs and medicines, have, however, obviously been fa more stringent than those required for latex gloves and othe non-ingested products. The recent considerable increase i the demand for examination gloves due to AIDS has result in the appearance of a significant quantity of substandar gloves, and consequently implementation of stricter regula tions concerning production control has arisen. It is becom ing increasingly important that such surgical products ma be readily identified using a batch coding system, to ensur that other products belonging to the same batch can be with drawn in the case of product failure.

Size marking on gloves has been achieved over the year using several methods. These have included stamping at one particular stage of the production process, engraving the glove former with an indented or raised number, colour coding the bead and introducing a coloured, reinforcing band around the arm of a non-beaded glove, the last two complying with a size/colour coding system. The first of these systems relies on the identification of the sized marking on the former by the operator, so that the operator stamps the same size on the glove.

The use of engraved formers, can, in the case of poor quality embossing, result in pinholes and weak areas. The coloured band has not been universally accepted due to the difficulty of applying the band as a dry film, as well as ensuring that it firmly adheres to the glove end, or, when in liquid form, the difficulty in applying a film of even thickness around the entire glove edge.

Lot numbers and dates are printed on sterilised surgical glove packaging for batch identification purposes. Sizes are usually shown on the gloves as well as on their respective packaging, but gloves need to be carefully controlled during production to ensure that they comply with the packaging details. Packaging must additionally be retained, so that faulty gloves may subsequently be identified. Diptechnology of Stroud, England, is a dipping technology specialist, particularly in the field of latex product manufacture.

Working in conjunction with one of its automatic dipping plant customers, the company has developed a system of size marking and production batch identification coding which is printed on each glove during the manufacturing process. This svstem can be modified to treat other products, and to incorporate trade names and other identification systems as necessary. This new online glove marking system is preprogrammed to the arrangement of formers on the plant so that the size marking automatically complies with the glove being identified. The computer control program also incorporates timing periods for date and time of production which are coded into the batch mark.

The number of each size of glove produced is counted and recorded, and if formers are absent from the line at any stage, they are ignored. A complete production record for each glove size is thereby compiled. The formers themselves are equipped with a unique alignment device, ensuring that they are all positioned with the palms facing the marking device. This allows the gloves to be printed in exactly the same place each time. Orientation of marking can be varied, depending on packaging requirements.

Diptechnology supplies and sets up plants for the manufacture of most latex products worldwide. It handles projects up to full turnkey operation as well as small manually-controlled units, and offers latex technological and design and consultancy services for fabrication and assembly of plant in the customer's own country.

New Promising Antimicrobial Agent — Dimethyl Fumarate (DMF)

DAYANAND Y. SUKHTHAKAR, TEJASWINI V. VYAS
Ganesh Anhydride Limited

Large amount of our agricultural and manufactured commodities are spoiled or impaired because of the growth of microorganisms. Moderate temperature and humid conditions present in most parts of this country give a very fertile ground for microorganisms to grow. Secondly our agriculture production is such that Maharashtra is dependent on wheat in Punjab and sugar produced in Maharashtra is distributed in remote villages of South India. Slow transport of the agriculture produce and age old methods of storing these products aggravate the problem. Dependent as we are on the rains we have to protect out grainaries for lean years in future. This will give an idea of the colossal problem we face in our country, with respect to storing agricutural commodities.

Micro-organisms particularly fungi including mold and yeast are widespread in nature and their growth is facilitated by moderate temperature and high humidity. Cereals, oilseeds, and animal feed are commonly stored in bulk quantity. *Penicillium expansum, Aspergillus niger*, and *Monilia sitophila* invade both stored seeds and products made form them. Certain mold produce mycotoxin. Alflatoxin produced from *Aspergillus flavus* in wheat and peanuts can cause illness to domesticated animals. It also produces liver cirrhosis in children. Aflatoxin reduces the growth of birds in poultry. It also produces hepatic cancer in certain species.

Bakery products are spoiled by *Rhizopus nigricans, Pencillium expansum, Asperigillus niger* and *Monilia Sitophila.* The mold however are killed during baking, but as soon as freshly baked products come out of the oven, fungus spores on them subsequently multiply and make the product unfit for human consumption.

This microbial invasion can be inhibited by addition of anti-microbial agents. Several additives such as propionic acid and propionates, benzoic acid and benzoates, sorbic acid and sorbates are used as anti-microbial agents. One major disadvantage with propionates, benzoates, and sorbates is that their anti-microbial activity is dependent upon pH, with greatest anti-microbial activity at acidic pH levels. However, most of the feed materials are neutral in pH. Acidification of food and feedstuffs optimize the effectiveness of these additivities, but make the product unpalatable. At neutral pH the amount of these additives required is substantially increased.

In yet another strategy Ultraviolet light has been used to prevent fungal contamination with limited success.

Dimethyl Fumarate (DMF) is the latest addition in food additives which has excellent antimicrobial property with a broad spectrum of activity against various micro-organisms.

The chemical structure or Dimethyl fumarate is given below.

$$CH_3 - O - \overset{\overset{\displaystyle O}{\|}}{C} - CH = CH - \overset{\overset{\displaystyle O}{\|}}{C} - O - CH_3$$

Effect of dimethyl fumarate

Dimethyl fumarate is known to inhibit the growth of inhibit various micro-organisms including fungi and bacteria.

A) Growth of fungi belonging to the following genera/-species were completely inhibited in pure culture systems by incorporating DMF at such low levels as 0.001-0.01% in potato dextrose agar (Difco) medium:

1. Absidia
2. Alternaria citri
3. Aspergillus flavus
4. Aspergillus niger
5. Aspergillus oryzae
6. Candida Krusei
7. Candida lipolytica
8. Candida trylanoids
9. Cladosporium
10. Cryptococcus albiens
11. Debaryomyces Kloeckeri
12. Fusarium
13. Geotrichum candidum
14. Hasenula anomala
15. Hansenula wengel
16. Penicillium digitatum
17. Pencillium expansum
18. Pencillium roqueforti
19. Rhitopus nigricans
20. Rhitopus oligesporus
21. Rhitopus stolinifer
21. Sporobolomyces
23. Thamnidium elgans
24. Torulopsis spaerica

B) In addition, DMF was found to inhibit the growth of the following bacteria at levels ranging from 0.001-0.01% in tryptic soya broth (Difco).

1. Alcaligenes Viscolactis
2. Bacillus coagulans
3. Escherichia coli
4. Lactobacillus acidophilus
5. Lactobacillus casei
6. Lactobacillus plantarum
7. Micrococcus flavus
8. Micrococcus lutea
9. Pseudomonas fluorescens
10. Salmonella typhimariun
11. Staphylococcus Qureus
12. Vibrio parahemolyticus

The anti-microbial property of DMF is exploited in various fields like protection of agricultural product, food and feed, bakery products, cosmetics and leather industries.

Reference:

(To be concluded)

United States Patent (19) 4,346,118. of Aug. 24, 1982.

News from Japan

SUMITOMO CHEMICAL WANTS TO BE AMONG WORLD'S TOP-10 AGROCHEMICAL MAKERS

Sumitomo Chemical Co. is determined to boost annual sales of its agrochemicals to $1 billion within five years to become one of the world's top-10 farm-chemical makers. To this end, the firm will try to consolidate its footing in Japan and the West as well as South America and East Europe to promote globalization.

In the U.S., Valent U.S.A. Corporation which the Japanese firm completely took over last September is likely to go into the black this year with successful marketing of Sumitomo chemicals. In Europe, Sumitomo established two years ago a subsidiary in France for farm-chemical operations and will take steps to enhance its business activities there.

The world agrochemical market has tended to be dominated by a small number of big businesses with ongoing M&A, alliances ad partnerships. In this milieu, Sumitomo considers that it will have to earn annual sales of at least $1 billion for survival as a farm-chemical maker in the world market.

To achieve this goal the firm believes it essential to establish a business setup enabling the evaluation of test results on experimental farms, and registration and marketing of new chemicals by itself in major markets. The firm has so far conducted agrochemical business in such a way as to market technical-grade chemicals and does not have its own sales routes for formulated products either in Japan or the West.

Sumitomo Chemical is estimated to currently rank 14th in the world agrochemical market with annual sales of slightly more than $600 million, including those of related products.

JAPAN STEPS TOWARD JOINING BASEL CONVENTION

A bill for regulation on exports/imports and disposal of specified harmful substances was approved late in April at meetings of related committees of the ruling Liberal Democratic Party. It will be introduced into the Diet after being approved by all relevant government departments.

The bill has been jointly worked out by the Ministry of International Trade and Industry, the Environment Agency and the Minstry of Health and Welfare: it entitles Japan to join the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, which was put into force May 5.

The new bill covers 47 hazardous chemical substances, all of which are also under the control of the Basel Convention and most of which are regulated in accordance with Japan's Waste Disposal and Public Cleansing Law. Unrecyclable, useless products will be put under stricter regulations with the two laws applied thereupon.

A MITI official claims: "A great stride towards progress is being made because government departments whose interests once clashed have begun to work together to enable Japan to join the Basel Convention."

Japan's chemical industry will be urged to take measures in keeping with the convention and the revision of the said waste-disposal law — which is now being examined by the Ministry of Health and Welfare — as well as by the Recycling Law, which was established in Japan late last year.

KIRIN, AMGEN AGREE TO DROP SUITS OVER G-CSF PATENTS

Kirin Brewer (Japan)-Amgen (U.S.) group and Chugai Pharmaceutical Co. (Japan) have reached basic agreement to the effect that both parties will drop court actions over patent infringement issues for the world with regard to a granulocyte colony stimulating factor (G-CSF).

Under the agreement, Chugai will stop development and marketing of G-CSF in the U.S., but both parties will be able to market the agent in the rest of the world; Chugai will withdraw a patent suit filed in February 1991 against Amgen at the federal district court for Columbia regarding G-CSF patents and Amgen will drop a patent-infringement suit against Chugai filed in January 1992 at the U.S. Patent Agency.

It is believed that both parties reached a compromise to save the time and expense necessary for court actions. The two parties have already marketed the agent in Japan, and Amgen has sold it in the U.S. and Europe.

The patent disputes over G-CSF between Chugai and Amgen followed the case between the two over an EPO (erythropoietin)-patent infringement, which resulted in a complete win for Amgen.

In the case of G-CSF, however, Chugai had applied for and been granted the patent rights in Japan earlier than Amgen. (Amgen's patents are now open to public inspection. In this connection, some take the view that Chugai has substantially compromised with Amgen on the case for some reason.

ASEAN'S 1ST FURFURAL, FURFURYL ALCOHOL PLANTS IN OPERATION

A Thai firm in which Japan's Kanematsu Corp. has a stake has put into regular operation production facilities capable of turning out 5,550 t/y each of furfural and furfuryl alcohol, etc. in the

Bangkok suburbs. These are the first mass-production facilities for such chemicals in the ASEAN (Association of Southeast Asian Nations) region.

Indo-Rama Chemicals (Thailand) Ltd. owned 75% by Thailand's Lohia business group of Indian origin, 17% by Kanematsu, and the rest by local businesses is producing furfural, furfuryl alcohol and acetic acid as a by-product using as materials corn and rice produced on the farmland nearby the facilities.

Kanematsu is Japan's leading supplier of furfural, importing it from China for refining petrochemicals. With the start-up of the above-mentioned facilities, the trader has now secured a production base for furfural in Southeast Asia. The Lohia group headquartered in Indonesia is handling fiber products, chemicals and steel in SE Asia.

The facilities are designed to produce furfuryl alcohol by hydrogenating furfural under high pressure. Most of the furfural produced is used for furfuryl alcohol which is utilized for cast binder and pharmaceuticals. The chemical will be exported mainly to other SE Asian countries, Australia and European countries.

By-produced acetic acid will be supplied to Thai users. The joint firm sees furfuryl alcohol demand rising further in future.

CHEMICAL PLANT INVESTMENT DROP OF 14% LIKELY: SURVEY

Plant-and-equipment investment planned by all Japanese industries for fiscal 1992 is projected to drop 7.3% from the estimated equivalent for the preceding year. This is shown in the results of a survey of private businesses conducted by the Economic Planning Agency. The plune was the largest since a similar survey was inaugurated in 1980.

A sharp decline (13.8%) is seen for manufacturing industries. The corresponding fall for the chemical industry is 14.0%, though its capital expenditure in 1991 is expected to have expanded by 4.8%. Equipment investment planned by non-manufacturing industries will decrease by as little as 2.9%, however.

Looking at the declines in plant-and-equipment investment by company size, big businesses with capital of more than £1,000 million ($7.5 million) will suffer a 5.0% fall on average while those with capital in the Yen 100 ~ 1,000 million range will register a 11.9% decline, showing the seriousness of the slump in capital expenditure envisaged by manufacturing companies of middle standing.

The survey results denote that corporate sentiment for capital spending is stronger than in the case with other surveys already conducted by other organsisations.

TOSOH TO SCALE DOWN PP CAPACITY EXPANSION

Tosoh Corp. has decided to scale down future addition to the polypropylene (PP) capacity.. According to the new plan, the firm will reduce the PP capacity planned earlier from 80,000 t/y to around 50,000 t/y and also postpone operation start-up by six months to one year to cope with the weakening market. The operation start-up was earlier set for February 1994.

The PP plan is part of the firm's petrochemical capacity expansion scheme with construction of an ethylene plant by the spring of 1995 at the core. The firm, however, remains careful in starting the ethylene plan in view of such adverse factors as the expected start up in 1992/1993 of two new ethylene plants by Mitsubishi Petrochemical Co. and Maruzen Petrochemical Co. and the economic slowdown likely to progress,

Among Tosoh's polyolefin project top priority has been placed on P because the company is lagging behin other makers in PP business. advanced into PP operation in the fa of 1990 through joint investment wi Chisso Corp. (44,000 t/y at Yokkaichi The latest plan is to be undertaken b Tosoh alone using its own technolog

ISOPROPYL ALCOHOL SUPPL SEEN BECOMING TIGHTER

The possibility that the domesti isopropyl-alcohol (IPA) market will b tight from May through June, i response to the tight supply of ra material propylene (PP), is ever increas ing.

Japanses IPA makers began periodi plant repairs one after another in th January~March period, thus tightenin the supply-and-demand situation con cerned. PP plants are also undergoin regular check-ups from April throug June and export contracts for a larg amount of the product have been concluded with overseas users.

Demand for use in paints, thinner and inks — major outlets for IPA — has stopped growing further due to an overall business slump, but that for use as CFC alternatives has attained steady growth.

IPA replaced CFC-113 as of 1990 in most application fields but production of 1,1,1-trichloroethane has been curtailed by 15% since the beginning of this year, thus probably increasing IPA demand. Production/use of 1,1,1-trichloroethane could be completely banned during 1995-96 period, depending on resolutions at the Montreal Protocol membership meeting this autumn. They would otherwise be halved in 1996 and completely banned by 1997.

Japan's IPA demand and production last year came to 138,000 and 119,000 tons, respectively. A total of 31,000 tons were imported, while 12,000 tons were shipped overseas.

UNMANNED COKE PRODUCTION PLANNED: MITSUBISHI KASEI

Mitsubishi Kasei Corp. has almost reached a decision on completely automating by 1995 its coke plants at the Kurosaki and Sakaide factories to increase the competitiveness of its carbon business. The firm's middle-and long-term plans attach importance to the strengthening of carbon business —coke business in particular.

The company has already begun taking steps to develop the software and robots necessary for automatic coke production in a bid to introduce them to parts of the existing lines by next March. The chemical firm considers that Japan is likely to be a leading supplier of coke in the world and that it is necessary to increase investment to raise the production efficiency of coke.

Mitsubishi Kasei is producing coke at the rate of 1.22 million t/y at its Kurosaki factory and 3.91 million t/y at its Sakaide factory with coke sales accounting for slightly more than 10% of the firm's total sales. Coke business has made a good contribution to the firm's performance but its profits decreased in the last one year affected by reduced steel production.

To make coke business profitable in the long term, the company considers it inevitable to diversify into specialities, improve derivatives business and implement thorough modernization of production systems to minimize costs. The firm says that the Kurosaki plant is now obsolete and has a problem with regard to competitiveness. The Sakaide plant also needs to be improved to obtain a competitive edge, the firm adds.

From the global viewpoint, Western businesses have been retreating from coke business successively and this trend is expected to increase further. It is very likely that Japan will become the major supplier of coke in the world.

PVC DOMESTIC DELIVERIES DROP 140,000 TONS IN FY91

Reflecting the economic slowdown, domestic deliveries of polyvinyl chloride (PVC) resin in fiscal 1991 decreased about 140,000 tons from the previous year to 1,829,962 tons (down 7.0%). In particular, rigid PVC (pipes, etc.) decreased 90,000 tons.

PVC deliveries including exports set a record high of 1,680,000 tons in 1987. Since then, year-to-year record highs were set for four straight year until fiscal 1990 when they exceeded 2,000,000 tons for the first time.

Since April of 1991, however, they showed a month-to-month decrease from the corresponding months of the previous year.

Although demand for construction is said to have hit bottom, rigid PVC demand during January ~ March decreased 8.5%, the greatest factor for the total demand decline. Total demand for rigid PVC in fiscal 1991 recorded 953,439 tons (8.7% drop from preceding year), non-rigid PVC registered 550,022 tons (down 6.1%), electrical wire and other uses totaled 317,501 tons (down 2.9%).

Since last September exports continued to increase, offsetting stagnant domestic demand, adding up to 121,243 tons, double the amount for the previous fiscal year. Exports in 1987 increased 125,000 tons. After that, they increased 50 ~ 60,000 tons a year.

As autumn demand was stagnant, PVC manufacturers curtailed production and this January ~ March production decreased by 10.1% from the same period to the 480,000-ton level.

MITSUBISHI PRTROCHEMICAL TO BUY 100,000 TONS OF NGL ON SPOT MARKET

Mitsubishi Petrochemical Co. intends to purchase 100,000 tons of heavy NGL (Natural Gasoline Liquid) on the spot market as the new ethylene plant (300,000 t/y) at its Kashima factory will be put into operation. The Kashima ethylene plant is designed to use diverse raw materials up to 40% of the total.

Use of heavy NGL is in line with the firm's policy of varying raw material for ethylene to increase competitiveness.

These facts are considered to be behind the spot purchase: the firm thought it necessary to deal with the NGL issue prudently, the supply-and-demand situation is easing slightly and the firm failed to obtain NGL from Saudi Arabia on a year-long basis. The company is thinking of buying the matrial around this summer.

The firm plans to purchase heavy NGL in the amount of 400, ~ 500,000 t/y after next year under a plan to raise the share of heavy NGL in the total materials of the new ethylene plant of 25% for the time being.

Japanese petrochemical makers are generally showing a strong interest in heavy NGL as it was exempted from taxation. As from this April, Mitsui Petrochemical Industries, Ltd. has concluded a long-term import contract with a European oil producer, and Showá Denko has also signed a similar pact with a New Zealand supplier.

FLAVORS & FRAGRANCES PRODUCTION IN 1991 DULL

Production of flavors and fragrances in 1991 was sluggish due to unseasonable weather as well as the economic slowdown.

Looking at domestic production by item, although flavors showed a comparatively favourable trend in the first half, they were sluggish in the latter half due to a long period of rainy weather after the summer.

In particular, the influence on the consumption of drinks and ice cream —major outlets in a normal year — was great. Production in the whole of the year was 29,540 tons (up 2.5% over previous year) or Yen 81,191 million by value (up 3.2%).

Production of fragrances recorded 7,787 tons (up 3.2%) or Yen 30,477 million (down 0.7%) by value, thus showing sluggishness. Natural essential oils and synthetic fragrances and flavors —raw materials for flavors and fragrances — were dull. Production of natural essential oils recorded 50 tons (down 16.7%) and that of synthetic fragrances and flavors registered 14,548 tons (up 1.2%).

Regarding the trends of exports and imports, imports continued on the high level of the previous year. In particular, natural esential oils and synthetic fragrances and flavours, both of which were inactive in the preceding year, increased by over 30%, while export growth became dull for all items and exports of synthetic fragrances and flavors/flavors were below the previous year's level.

INDUSTRY GROUP TO STEP UP POLYSTYRENE FOAM RECYCLING

A group of plastic foam makers will step up retrieval and recycling of the product over the next three years. The Japan Expanded Polystyrene Recycling Association (JEPSRA) said its 1992 action program calls for doubling capacity at two recycling facilities in Ibaraki and Nara Prefectures to 720 and 360 t/y, respectively.

New recycling centers will be established at 30 locations by 1995.

Targeted expanded polystyrene is used mainly in the form of fish boxes and packing material for household electrical appliances.

The association aims to increase overall recycling volume to 43,600 tons or 25% of total consumption in 1995 from 19,400 tons or 12.3% in 1991.

It will also lease recycling machines to major plastic foam users and share part of the operating costs. It now rents machines to 16 wholesale markets across the country.

The association will continue to promote development of recycling technology in order to further elevate the retrieval and recycling ratio.

JAPANESE FIRM STARTS MALAYSIAN 7,000-T/Y PS COMPOUND PLANT

Nippin Steel Chemical Co. (NSCO) has begun producing synthetic resin compound in Malaysia. This is the first overseas resin-compound project to be started among a number of such plans now under way in other countries.

NSCC Compounds, a wholly owned subsidiary of NSCC based in Kuala Lumpur, started in April commercial operation of a 7,000-t/y plant for polystyrene (PS) compound used for consumer electronic appliances. PS resin is used for the housings of such appliances

In Malaysia, the firm purchased plant sites to build plants for PS compound and printed circuit boards. These plants are intended to supply parts and part material to Japanese consumer electronics makers operating in Malaysia. Such makers are producing large-sized TV sets and VTRs, etc., there mainly for export, creating a large market for parts and part material.

NSCC's PS compound has a high degree of fire-proofness and can satisfy the demanding Japanese makers.

The firm is considering adding additional capacity to the plant in 1994 as demand is expected to continue growing in the country. The company is also working on plans to produce PS compound in the U.S., France, the U.K. and China by means of takeovers or joint ventures. It is the first time for NSCC to produce PS compound abroad through a wholly owned subsidiary.

PTA PLANT PUT INTO TRIAL OPERATION IN TAIWAN

Early in May ICI (U.K.) is scheduled to feed raw material for the first time into a 350,000-t/y purified terephthalic acid (PTA) plant built in Taiwan and put the plant into trial operation in June. The British company is expected to export the product to other Asian countries so as not to disturb the Taiwanese PTA market.

Kashima Oil Co. (Japan) is scheduled to supply 5,000 tons of feedstock p-xylene for the planned trial operation. ICI is believed to be moving toward obtaining feedstock in the international market as well as from the Japanese supplier.

It will be interesting to see how price negotiations between ICI and p-xylene makers will develop from now on. The said plant is about 100 km away from the nearest port, so freight for the feedstock will be comparatively high, thereby adversely affecting the British firm's competitiveness in PTA operations.

Start-up of the new plant will boost Taiwan's combined PTA capacity to 1.83 million t/y — considerably higher than the actual domestic demand of 1.60 million t/y.

In Taiwan, PTA capacity has been aggressively expanded in proportion to the steady growth of polyester fiber —a main PTA outlet. The Tungyun Group started up last year a 280,000-t/y plant. The group has also inaugurated a PTA project in Thailand and, in connection with this, stepped up PTA exports from Taiwan for pre-marketing purposes.

New Developments from Japan

TEIJIN, DU PONT TO JOINTLY DEVELOP HIGH-TECH PEN FILMS

Teijin Ltd., a major Japanese polyester manufacturer, has agreed with Du Pont of the United States to develop and market high-technology films made of polyethylene naphthalate (PEN). They intend to exploit markets in Asia and U.S./Europe, respectively.

Potential applications of the targeted films are insulating material and film capacitors for electrical machines, etc.

The two companies already are co-operating in manufacturing and selling polyethylene terephthalate (PET) films for audio and video use in joint venture operations set up in September in the U.S. and Luxemburg.

PEN films are more durable than PET films and are more resistant to heat, chemicals, and radioactivity. PEN films, however, cost twice as much as PET films, so are used for special purposes, and Teijin produces just 1,000 tons annually.

Teijin has succeeded in commercializing PEN films, and the two companies will study possible improvements that can be made in them.

Teijin's PEN film production will grow to 10,000 t/y in three years as there is potential demand in various fields. The company has recently doubled the production capacity and is building a 4,800-t/y plant in Utsunomiya.

HOECHST TO PRODUCE PHYLLOSILICATE AS BUILDER IN JAPAN AND GERMANY

The Hoechst group of Germany intends to commercialize, both in Germany and Japan, the phyllosilicate it has developed. The chemical is a multifunctional detergent builder mainly made of water-glass and is effective for use in synthetic detergents for (industrial-use) restaurant-use dish washers in addition to household-use synthetic powder detergents.

Hoechst plans to construct a phyllosilicate ("SKS-6") plant with about 25,000-t/y capacity at its Knappsack factory in Germany where the firm is operating a 2,500-t/y semi-commercial plant. In Japan the firm is intent on building a 20,000-t/y plant through joint investment with Tokuyama Soda Co. of Japan.

The plan for the Knappsack factory is now in the final stage. In Japan, Hoechst and Tokuyama are considering plant construction start-up within the year at the earliest depending on the result of the feasibility studies, expected by May or June.

Tokuyama is in an advantageous position regarding supply of material water-glass.

Using a semi-commercial plant of 2,500 ~ 3,000 t/y in France, the Hoechst group has been supplying the chemical as samples to European and Japanese users to cultivate its markets. A Hoechst official says that the group firms have received favourable user responses in Japan and Europe.

SKS-6 is said to have the following advantages: (1) it softens water efficiently; (2) it is a good buffer with regard to pH; and (3) it has a high degree of storage stability.

PROMISING COMPOUND PRODUCED FROM VEGETABLE INGREDIENT

Mitsubishi Kasei Corp. has succeeded in pioneering technology for mass-producing cyclofructan (CFR) from inulin (polysaccharide) obtained from chicory. CFR, categorized as a cyclic oligosaccharide, is highly soluble in water.

The company has obtained enzyme from *Bacillus circulans:* the product facilitating effficient CFR production is put into a bioreactor, in which inulin is converted into CFR.

The new process will, the company claims, help supply CFR at a low price nearly equivalent to that of cyclodextrin (CD). CFR has higher water-solubility than CD which is also classified as a cyclic oligosaccharide.

The company expects the new product to replace expensive crown ether —which is priced at Yen 1 million/kg. ($7,519/kg) and employed as an organic-synthesis catalyst — and find outlets in pharmaceutical, food-additive and reagent operations. It has installed a pilot plant and plans to start sample deliveries.

Sweeteners are obtained from chicory which is grown in European countries, Belgium in particular. The company envisages building a commercial plant in Belgium or France when it is sure of CFR's commercial viability.

PRECIOUS METALS BIOLOGICALLY RECOVERED FROM WASTEWATER

Researchers at Miyazaki Medical College have succeeded in recovering precious metals (gold and palladium) contained in industrial/mining wastewater in PPM-order amounts using microorganisms as adsorbents. Precious metals thereby adsorbed can easily be separated therefrom with thiourea as an intermediary. The recovery rate concerned is as high as 98.6%.

They have confirmed that *Pseudomonas* bacteria and *Streptomyces phaeochromogenes, Micrococcus luteus* are capable of efficiently adsorbing gold and palladium, respectively.

Microorganisms — both live and dead ones — can be used for the said purpose. Used bacteria — discharged from amino-acid plants in large quantities — are therefore, available. For example, they claim, one gram of the bacteria recovered 180 mg. of gold. The recovery rate can be raised further if related conditions are improved. The microorganisms are capable of quickly (in 5 ~ 10 minutes) concentrating gold and may be applied to the treatment of wastewater emitted from surface-treatment and electronics-related plants.

CHOLESTEROL CATABOLITE PREVENTS OBESITY: RESEARCHERS

Researchers at the Institute for Physical and Chemical Research (RIKEN) have discovered that cholestenone, catabolite of cholesterol, is effective in preventing obesity. It is easily mass-produced and may be used effectively for diet foods and obesity remedies, a researcher involved says.

According to the researcher, animal tests using mice showed that cholestenone helps prevent the storage of lipid and has neither side-effects nor carcinogenic effects even after extended use. Cholestenone is produced in metabolism of cholesterol by means of intestinal bacilli. It is present in the human body and so has no harmful effect on the body; it can be manufactured by a synthetic process or a specific enzyme.

The report says that a group of mice given fatty feedstuff with a 0.5% cholestenone content for an extended period (17 months) grew to normal weight and remained healthy, unlike two other groups given different types of fatty feedstuff.

The researcher suggests that cholesnone acts to inhibit the growth of lipoprotein which delivers the dietary lipid intake to the fatty tissues.

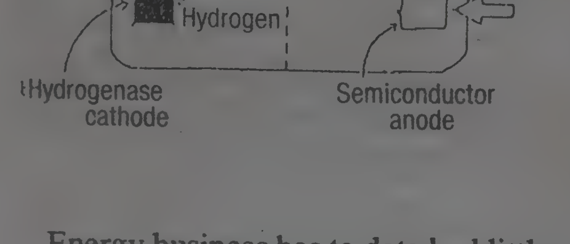
CAN BIOTECHNOLOGY BE HARNESSED FOR ENERGY BUSINESS?

Central Research Institute of Electric Power Industry has embarked on research aimed at pioneering biotechnology capable of producing large quantities of inexpensive hydrogen.

It envisages employing hydrogenase — enzyme obtained from hydrogen bacteria — as a biological electrode and electrolyzing water with sunbeams, thereby generating hydrogen.

Hydrogenase is usually unstable in the air and at high temperature. The institute has found hydrogen bacteria living in a hot spring located in the Kanto region and confirmed that their hydrogenase is capable of maintaining its own activity in the air and at high temperatures of up to 80°C under pH 2 conditions. The enzyme is expected to facilitate efficient hydrogen production.

Hydrogenase-applied hydrogen production



Energy business has to date had little involvement in biotechnology but, the institute claims, it will make a great contribution to the business if hydrogenase-applied hydrogen production is realized.

Hydrogenase has the same catalytic function as platinum does, so it may be applied to fuel-cell electrodes and bi reactors. The institute plans to refine ar immobilize the enzyme for practic use.

AGENTS WITH FAR GREATER FIREPROOFING MADE: TOYOBO

Toyobo Co. has developed and begu sample shipments of "ultrafin antimony-oxide particles" whose spe cific surface area is more than 1,00 times that of ordinary equivalents an diameters are less than 10 microns combined with halogen compounds, th particles will be used as very effectiv fireproofing compounds.

The far greater specific surface are of the particles dramatically raises th fireproofing effects of the compound and reduces the amount of applicatio required, the fiber company says. Th particles also have a high level of trans parency and so are suitable for produc ing brighter colors; they are easily mixed and quite compatible with resin as well, according to the firm.

Their fireproofness can be maximized when applied to a variety of resins and latex in combination with halogen-based fire retardants, the company explains They will be effectively applied to a wide range of resins to be used for diverse products such as industrial vehicles, aircraft parts, interior goods and bedding, for which higher level of fireproofness are required. The new retardants are available in two types — solid and powder.

NEW PET FILMS TRANSPARENT

Mitsubishi Kasei Polytec Co. has developed and begun sample shipments of films based on PET (polyethylene terephthalate) which are transparent and have extremely good gas barrier properties. Used for packaging and containers, the new films — unlike conventional equivalents enable their contents to be seen.

MARKET INFORMATION

Dimethyl formamide slumps

Ready availability of material has seen the price of dimethyl formamide decline sharply by Rs. 2 per kg in the Bombay Chemicals Market during the week under review. Prices have otherwise remained steady, and a tight financial position has seen a buyers market. The dye intermediates section has seen average demand from exporters.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on June 16, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.25
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	5.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	105.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	6.00
Borax (Granular)	38.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	95.00
Butyl carbitol	110.00
Caustic soda (Flakes)	17.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	14.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	4,400.00
Copper sulphate	34.00
Chromic acid	80.00
Dimethyl formamide	85.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	180.00

Hydro	60.00
Hyflosupercell	48.00
Hexamine (Resale)	32.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	50.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	19.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	47.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	200.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	40.00
Phthalic anhydride (Resale)	41.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	72+ST
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	75.00
Titanium Dioxide Anatase (China)	64.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	105+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	20.50
Acetic Anhydride (Resale)	35.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	70.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	45.00
Benzyl Alcohol	60.00
Benzyl Chloride	3
Benzo trichloride	1
Benzoyl chloride	2
Bromine Liquid	11
Chloroform	6
Carbon Tetrachloride	2
Cellosolve	7
Cyclohexanone	8
Cyclohexanol	85
Diacetone (Resale)	2
Diethyl Oxalate	3
Diethyl glycol (DEG) (Resale)	4
Dioctyl Phthalate	6
Diallyl Phthalate	4
Dimethyl Phthalate	48
Dioctyl Adipate	58
Dibutyl Adipate	4
Dipentene	1
Dimethylamine 40%	30
Dimethylamine 50%	35
Ethyl Acetate	2
Ethyl Acrylate	9
Ethylene Dichloride	2
Ethylene Glycol	3
Formic Acid (Imp.)	34
Formaldehyde (Resale)	7
Glycerine (CP)	70
Glycerine (IW)	65
Hydrogen Peroxide 50% (Resale)	47
Isopropyl Alcohol	45
Isobutyl Alcohol (Resale)	35
Monoethanolamine (Resale)	95
Melamine	62
Methyl Ethyl Ketone	58
Methyl Isobutyl Ketone	60
Methyl Acrylate	72
Methylene Dichloride (Resale)	30

Carbitol	115.00+ST
Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	68.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	80.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	28.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	18.50
N-Heptane	11.00
N-Hexane	21.00
Methanol	11.00
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	19.50
Xylene (Ortho)	32.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	95.00
Alpha Naphthol (Imp.)	210.00
Aceto Acetic Ester (Methyl)	152.00
Acetanilide	60.00
Anthraquinone	155.00
Anthranilic Acid	110.00
2-Amino 4-Nitrophenol	160.00
Blue B. Base (Local)	330.00
Beta Naphthol	72.00
Benzidine Dihydrochloride (BDH)	94.00
Bromamine Acid (IDI)	680.00
BON Acid	125.00
CPC (Crude)	115.00
Chicago Acid (Atul)	360.00
Coach Acid	60.00
Cyanuric Chloride (German)	245.00
DEMAP	255.00
2,4-DNCB	28.00
Dichlone (Imp.)	400.00
Dimethyl Aniline	100.00
Diethyl Aniline	180.00
Diethyl Sulphate (Japan)	92.00
Diethyl Sulphate (Local)	72.00
Diamino stilbene disulphonic acid	210.00
3,3-DCB	260.00
Diphenylamine (U.K.)	160.00
Gamma Acid (Atul)	220.00
Gamma Acid (Local)	180.00
H. Acid (Atul)	170.00
G. Salt	80.00
J. Acid	360.00
J. Acid Urea	4
K. Acid	12
MPDS (Local)	15
MNA	13
Meta Ureido Aniline	18
MPD (Local)	17
MPD (German)	20
N-Methyl J. Acid	53
N-Methyl Aniline	13
Naphthalene (Refined)	3
Ortho Anisidine (OA) (Imp.)	10
Ortho Dichloro Benzene (ODCB)	2
OT Base	17
OT Liquid	7
Para Dichloro Benzene (PDCB)	3
Para Anisidine (PA local)	15
PNA	8
Para Cresidine (Imp.)	34
Para Amino Azo Benzene (India)	14
PNCB (HOC)	4
Para Nitro Toluene	9
1-Phenyl 3-Methyl 5-Pyrazolone	17
Phenyl J. Acid	42
PT Base	16
Rhoduline Acid	60
Resist Salt 80%	2
Resorcinol	35
Sodium Naphthionate	8
5-Sulpho-Anthranilic Acid	11
Sulphanilic Acid	4
Sulpho Tobias Acid	14
Tobias Acid (Imp.)	11
Metanilic Acid	5
MTD (German)	18
Vinyl Sulphone	12

Bombay Drugs Market

(Prices as on June 16, 1992)

Product	Rs./kg.
Adipic Acid	100
Aerosil	590
Aluminium Hydroxide IP	43
Ampicillin Sodium	4400
Ampicillin Trihydrate	3200
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2700
Analgin	315
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1450
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium Lactate	30
Calcium D Pantothenate	1475
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2750
Chlorpropamide	235
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3100
Cimetidine	3350
Citric Acid IP	90
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	1950
Diclofenac Sodium	2350
Dicyclomine HCl	2100
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	350
Disodium Hydrogen Citrate	90
Dithranol	7500
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2650
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	725
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	120
Hydroxylamine HCl	575
Hydroxylamine Sulphate	100
Ibuprofen IP	525
Imipramine HCl	5000
Indomethazine	1000
I.N.H.	375
Inositol IP	1350
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	105
Lactic Acid (Japan)	165
Levamisole	1950
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	160
L. Lysine Pharma Grade	250
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	275
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	325
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	500
Metronidazole Benzoate	515
Morpholine	180
Neomycine Sulphate	4200
Niacin	300
Niacinamide	375
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	180
Nipagin Sodium	190
Nipasol Plain	280
Nipasol Sodium (Propyl Paraben Sodium)	330
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	5100
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	142
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	360
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	225
Piperazine Hexahydrate	180
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2300
Pyroxicam	2900
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	280
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	825
Sulphacetamide Sodium	370

Product	Rs./kg
Sulphadoxine	2900
Sulphamethoxazole	365
Sulphasomidine	475
Sulphaphenazole	325
Terbutaline Sulphate	30000
Tinidazole	480
Theophylline Anhydrous	415
Thiacetazone	325
Thoridazine HCl	20000
Thycol (Potassium Gluconate Sulphate)	500
Tolbutamide	225
Trifluopromazine HCl	11000
Trifluoperazine HCl	12500
Trimethoprim IP	1850
Tween 80	275
Vitamin B6 Hydrochloride	3000
Vitamin B2 5-Phosphate	4600
Vitamin K-3 (Water soluble)	750

DRUGS INTERMEDIATES

Product	Rs./kg
1-Amino-4-Methyl Piperazine	1400
2-Aminopyridine	575
Beta Picoline	230
2-Chloro Propionic Acid	50
2-Chloro Propionic Chloride	80
3-Chloro 4-Fluoro Aniline	1500
2:4-Dichloro Benzoic Acid	550
2,6-Dichloro Aniline	775
3,4-Diamino Benzophenone	470
Diethyl Malonate	95
Diethyl Oxalate	45
Dimethyl Acetamide	175
Dimethyl Amino Ethyl Chloride HCl	220
Dimethyl Dichloro Silane	195
Dimethyl Sulphoxide	200
Furoic Acid	165
Isobutyl Benzene	200
Lasamide	925
2,6-Lutidine	1750
1-Methyl 1-Amino Methyl Thio 2-Nitro Ethane	1550
2-Methyl 5 Nitro Imidazole	180
Methyl Acetoacetic Ester	160
Methyl Chloro Formate	100
Methyl Isothiocyanate	400
Nitromethane	200
N-Butyl Diethyl Malonate	170
N-Methyl Piperazine	850
Ortho Nitro Benzaldehyde	1400
Para Chloro Benzoic Acid	190
Para Hydroxy Acetophenone	800
Para Hydroxy Phenyl Acetamide	1800
Pivaloyl Chloride	410
Propionic Anhydride	280

Bombay Dyes Market

(Prices as on June 16, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.10
Dark Brown 3B	411.10

BASE COLOURS	Per Kg.
Fast Yellow GC	77.75
Fast Orange GC	128.40
Fast Scarlet R	198.05
Fast Scarlet RC	128.40
Fast Scarlet RCR	105.60
Fast Scarlet G	115.75
Fast Scarlet GN	92.95
Fast Scarlet GG	77.75
Fast Scarlet GGS	73.95
Fast Red B	233.50
Fast Red RC	115.75
Fast Red R Flakes	158.80
Fast Red TR	181.60
Fast Red TR Oil	223.35
Fast Red RL	251.20
Fast Red KB Oil	251.20
Fast Bordeaux GP	236.00
Fast Garnet GBC	103.05
Fast Violet B	548.80
Fast Blue BB	566.50

NAPHTHOL COLOURS	Per Kg.
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4B!	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.5
Blue RR Supra Powder	629.3
Brill. Blue 2R Supra Disp.	115.6
Dark Blue 2R Powder Fine	512.6
Blue BC Supra Disp.	419.6
Jade Green XBN Powder Fine	555.8
Jade Green XBN Acra Conc. Pdr.	1026.0
Jade Green 2G Pdr. Fine	533.2
Jade Green 2G Ptg. Paste	125.4
Jade Green XBN Ptg. Paste	126.0
Jade Green 2G Supra Disp.	618.0
Olive D Pdr. Fine	563.9
Olive Green B Supra Disp.	421.7
Jade Green XBN Supra Disp. (N)	327.3
Olive OMW Pdr. Fine	698.5
Olive OMW Supra Disp.	538.0
Olive D Supra Disp.	361.7
Olive R Supra Disp.	470.2
Olive D Ptg. Paste	193.0
Olive Green B Ptg. Paste	199.1
Olive Green B Acra Conc.	741.1
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: JUNE 12 (NNS) On the whole, an easy tendency was noticed in the local chemicals market during the week under review. On offerings by the stockists due to tight money market conditions coupled with lack of follow up support, citric acid Chinese and Bombay Dyeing slumped by Rs. 50 each at Rs. 4200 and Rs. 4750 per 50 kgs respectively. For want of support, mercury closed the week with a loss of Rs. 100 at Rs. 7,900 per flask. On discouraging advices from Bombay coupled with weak demand, safolite slipped by Rs. 4 at Rs. 72 a kg. On improved supply coupled with slack support, tartaric acid France was down by Rs. 4 at Rs. 484 a kg. Similarly, on commencement of supply of titanium K. Brand, titanium dioxide TTP lost Re. one at Rs. 73 per kg. K. Brand titanium dioxide maintained its last week closings of Rs. 95 a kg. On good offerings coupled with slack demand, soda bicarb tumbled down by Rs. 5 at Rs. 410/420 per 50 kgs. Because of weak demand, caustic soda flakes remained subdued at Rs. 810/820 per 50 kgs. In the absence of support from gur units and due to weak Bombay advices, sodium hydro sulphite kalali was down by Re. one at Rs. 64 a kg. while on better buying support, sodium hydro sulphite Gulshan remained firm at its last week closings of Rs. 55.50 a kg. Tamilnadu and Damosha hydro remained stable at Rs. 59.50 and Rs. 62 a kg. respectively. Despite weak support, rangolite Germany remained firm at Rs. 115 a kg. due to paucity of ready stock.

Due to restricted supplies coupled with emergance of renewed buying support, menthol bold rose to Rs. 270 from Rs. 265 a kg. However, due to restricted supplies and on emergance of renewed buying support, menthol flake marked up by Rs. 12 at Rs. 240 a kg and thin medium quality menthol improved by Rs. 10 at Rs. 255 and Rs. 260 per kg respectively. Menthol oil marked up by Rs. 10 at Rs. 170 per kg due to paucity of ready stock.

(DELHI MARKET RATES AS ON JUNE 12, 1992)

Ammonia Bicarb (Per 25 Kg.)	170.00
Mercury (Per flask)	7,900.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	810/820.00
Citric acid (Per 50 Kg.)	4,200/4,750.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCl (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	410/420.00
Sod. Hydrosulphite (Per Kg.)	55.50/64.00
Rangolite (Per Kg.)	115.00
Safolite (Per Kg.)	75.00
Chatkolite (Per Kg.)	72.00
Decolite (Per Kg.)	96.00
DMO (per Kg.)	65.00
Boric acid Technical (Per 50 Kg.)	2,800.00
Paraffin Wax (Per 50 Kg.)	1,125.00
Slack wax (Per metric tonne)	12,600.00
Tartaric Acid (France Per Kg.)	484.00
Borax Granular (Per 50 Kg.)	1,650.00
Borax Crystal (Per 50 Kg.)	1,925.00
Sodium Nitrite (Per 50 Kg.)	750/825.00
Sodium Nitrate (Per 50 Kg.)	530.00
Camphor Thal (Per Kg.)	138.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	270.00
Menthol Medium (Per Kg.)	260.00
Menthol Flake (Per Kg.)	242.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	170.00
Glycerine (Per Kg.)	65.00/70.00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.50
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	43.50/44.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (per 50 Kg.)	750.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	73.00
Titanium Dioxide RC-822 (Per Kg.)	95.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	73.00
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	56.00/66.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,075.00
Match Wax (Per tonne)	18,000.00
Residue Wax	8,000.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T.	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

The recession in automobile and engineering industries in South is affecting the chemical market and sales of chemicals have been dropping. Citric acid prices have shown a decline on better availability. Titanium dioxide prices are up due to increase in prices by manufacturers. Benzene though under short supply, the import is not felt. Di butyl phthalate prices have spurted up due to non-availability of butanol. The prices of caustic soda flakes have been dropping due to better availability. Though there has been no production of soda ash at one of the units in Tamilnadu, the price of soda has not been affected which continues to be the same as at earlier weeks.

(MADRAS MARKET RATES AS ON JUNE 13, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.50
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	45.00
Ammonium Chloride (per kg)	4.25
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per kg)	6.00
Borax (per kg)	32.00
Boric Acid (per kg)	64.00
Calcium Chloride Solid (per kg)	4.00
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	9.00
Calcium Carbonate (Precipitated) (per kg)	8.00
Caustic Soda Flakes (per kg)	16.00
Chromic Acid (per kg)	72.00
Copper Sulphate (per kg)	40.00
Ferric Chloride (Lumps) (per kg)	10.50
Ferric Chloride (Anhydrous) (per kg)	15.00
Ferrous Sulphate Crystal (per kg)	5.50
Hydros (TCPL) (per kg)	58.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	43.00
Hyflosupercell (per kg)	48.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	24.00
Magnesium Chloride (per kg)	6.00
Magnesium Sulphate (per kg)	4.00
Mercury (per 34.5 kgs)	8,000.00
Nickel Chloride (per kg)	200.00
Nickel Sulphate (per kg)	200.00
Phosphoric Acid (per kg)	40.00
Potassium Carbonate (per kg)	40.00
Potassium Chromate (per kg)	46.00
Potassium Hydroxide (per kg)	46.00
Soda Ash (TAC) (per 75 kgs)	525.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	10.00
Sodium Sulphite (per kg)	16.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	29.00
Trisodium Phosphate (per kg)	15.00
Titanium Dioxide (Anatase) (per kg)	76.00
Titanium Dioxide (Rutile) (per kg)	105.00
Zinc Chloride (per kg)	21.00
Zinc Oxide (per kg)	67.00
Zinc Sulphate (per kg)	16.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	35.
Acetic Acid (per kg)	22.0
Acid Slurry (per kg)	36.0
Benzoic Acid (per kg)	45.0
Citric Acid (per kg)	90.0
Formaldehyde (per kg)	11.0
Glycerine I.W. (per kg)	69.0
Glue Flakes (per kg)	18.0
Hexamine (per kg)	36.0
Maleic Anhydride (per kg)	48.0
Menthol Crystals (per kg)	250.0
Oxalic Acid (per kg)	17.0
Pentaerythritol (per kg)	68.0
Phenol (per kg)	54.0
Polyvinyl Alcohol Powder (per kg)	190.00
Phthalic Anhydride (per kg)	45.00
Sodium Acetate (per kg)	16.00
Sodium Alginate (per kg)	230.00
Sorbitol (per kg)	27.00
Urea (Technical) (per kg)	4.00

SOLVENTS

Acetone -- HOCL (per kg)	33.00
Benzene (per litre)	24.00
Butanol (per kg)	70.00
Butyl Acetate (per kg)	58.00
Carbon Tetra Chloride (per kg)	27.00
Cellosolve (per kg)	80.00
Chloroform (per kg)	35.00
Diacetone Alcohol (per kg)	46.00
Diethylene Glycol (per kg)	43.00
Di-butyl Phthalate (per kg)	75.00
Di-octyl Phthalate (per kg)	72.00
Ethyl Acetate (per kg)	28.00
Isopropyl Alcohol (per kg)	45.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	30.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	60.00
Octanol (per kg)	80.00
PEG 400 (per kg)	80.00
Perchloroethylene (per kg)	40.00
Propylene Glycol (per kg)	67.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	38.00
Toluene (per kg)	25.00
Xylene (per kg)	35.00

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Cochin Refineries Ltd., Attn: Chief Manager (Materials) Post Bag No. 2, Ambalamugal 682 302, Kerala.	Hydrochloric acid (28-30%) Sodium hydroxide (45-48%) (Caustic lye) Rayon Grade	6,00,000 kgs. 6,00,000 kgs.	REQ/9270 REQ/9271	2.7.92 "
(Last date for sale of tender forms: 22.6.1991; Cost of tender forms: Rs. 100 for hydrochloric acid and Rs. 150 for sodium hydroxide).				
Rashtriya Chemicals & Fert. Ltd., Attn: Ch. Mat. Manager (P&S) Chembur, Bombay 400 074.	Caustic soda lye (on Annual Rate Contract basis)	3,000 MT	DC/MG-80429	29.6.1992
(Last date for sale of tender forms: 26.6.91; Cost of Tender forms: Rs. 250).				
U.P. State Handloom Corpn. Ltd., Attn: Dy. General Manager, Hathkargha Bhavan, G.T. Road, Kanpur 208 005.	Dyestuffs like Naphthol, Reactive, Vat, Vat pastes, Rapid, Fast, Pigment, Indigosol, Sulphur etc. and chemicals and auxiliaries.			Immediate
OFFERS FOR SALE				
Gujarat State Fertilizers Co. Ltd. Attn: General Manager (MM), P.O. Fertilizernagar 391 750, Dist. Baroda, Gujarat.	Transformer oil Ethylene glycol		ST/01/39/92 ST/01/45/92	16.7.92
(Last date for sale of tender forms: 7.7.1992. Cost of tender forms: Rs. 50.00).				
PLANT, EQUIPMENT & INSTRUMENTS				
Engineering College, Attn: The Registrar, Kota-9, Rajasthan.	Hot Wire Anemometer Digital temperature indicator Load Cell, Over, Heating Tapes, Cords, Digital Milivolt Meter, Instrumentation & I.C. tutors, micromonometers. Eprum programmer & eraser, power supplies.		INST/2 INST/3	6.7.92 "
(Last date for receipt of tender forms and tender fees are: 2.7.92 -- Rs. 100 and 3.7.92 -- Rs. 50 respectively).				
Indian Oil Corporation Ltd., Attn: Ch. Materials Manager, 8th Floor, Kailash Building, 26, Kasturba Gandhi Marg, New Delhi 110 001.	Motor operated and hand operated gate valves and motor operated ball valves	varied according to specifications	PLM/2372/92	21.7.92
(Last date for sale of tender documents: 3.7.92; Cost of tender documents: Rs. 500.00)				
Indian Institute of Technology, Attn: Dy. Registrar (MM) Powai, Bombay 400 076.	Thermal analyser with data acqusition system and modules. Temp. range: 200°C to 1600 °C Optical microscope		MPAS/EQP/NPS/001/92/REG/L CN/-/EQP/92/001/NPS/1/MT	1.7.92 3.7.92

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
National Thermal Power Corporation Limited Attn: Manager (CMM), Skipper House, 62-69, Nehru Place, New Delhi 110 019.	Non-contact thermometer UV/visible spectrophotometer	1 No. 1 No.	01/CMPG/1-953/92 01/CMPG/1-958/92	

(Last date for sale of tender documents: 15.7.92. Due date given in the tender documents. Cost of tender: Rs. 200 eac

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Oil & Natural Gas Commission, Aggn: Gen. Manager (MM), OBG, Bombay Reg. Business Centre, Ground Floor, A-Wing, Vasudhara Bhavan, Bandra (E), Bombay 400 051.	Dissolved oxygen meter		BRBC/OBG/MAT/181/DPF/90-91/OT-918	21.7.92

(Last date for sale of tender documents: 20.7.92; Cost of tender documents: Rs. 500).

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Travancore Titanium Products Ltd. Attn: Gen. Manager (C&A), Kochuveli, Trivandrum 695 021.	Scrubber system — start up for DCDA sulphuric acid plant capacity -- 450 tonnes per day.		CD:PR:CC:MMA:350	30.6.92

TRANSPORTS

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Bharat Petroleum Corpn. Ltd., Attn: Senior Manager Inland Transportation, 12th Floor, E-Wing, Maker Towers, Cuffe Parade, Bombay 400 005.	Transport of petroleum products from Bombay (Sewree/Vashi), Baroda, Pune (Loni), Vasco, Sabarmati and Kandla to upcountry depots in Maharashtra, Gujarat, Madhya Pradesh and Karnataka for a period of three years.			
Hindustan Cables Ltd., Attn: Ch. Commercial Manager, Rupnarainpur Unit, P.O. Hindustan Cables, Dist. Burdwan, West Bengal.	Transportation of furnace oil from Indian Oil Corporation, Haldia/Budge-Budge/Barauni to HCL works at Rupnarainpur		SPC/2228/P-03/188	30.6.92

(Last date for sale of tender document: 29.6.92. Cost of tender forms: Rs. 250.00)
(Tender forms are also available from their offices at Calcutta, New Delhi and Hyderabad.)

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Hindustan Petroleum Corpn. Ltd., Attn: General Manager, West Zone, 2nd Floor, Richardson & Cruddas Building, Sir J.J. Road, Byculla, Bombay 400 008.	Transportation of various petroleum products in bulk ex any oil company, refineries, terminals, installations in Greater Bombay/Bassein/Vashi and also IOBL -- Trombay Complex, Bombay to their retail and local outlets and upcountry locations.		IOC-HPC/BULK/92-95/Bombay-Vashi/1	8.7.92

(Last date for sale of tender forms: 7.7.92; Cost of tender documents: Rs. 100).

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Hindustan Petroleum Corpn. Ltd., Attn: General Manager, West Zone, 2nd Floor, Richardson & Cruddas Building, Sir J.J. Road, Byculla, Bombay 400 008.	Transportation of various petroleum products in bulk ex their depots in Kolhapur, Pune, Hazarwadi, Manmad, Miraj, Sholapur, and Loni terminals to their retail and local and upcountry outlets		IOC-HPC/BULK/92-95/Pune-Loni/9	14.7.92

(Last date for sale of tender forms: 7.7.92; Cost of tender documents: Rs. 100).

INTERNATIONAL BULK CHEMICAL PRICES

SPOT PRICES AS ON MAY 20, 1992

Product	European Price range	US Price range
Naphtha	$184-185/m.t. (cif)	
Gasoil	$173-174/m.t. (cif)	
Propane		30.5-31.25 cts/gal (fob)
Butane		35.25-35.5 cts/gal (fob)
Ethylene	$380-390/m.t. (cif)	14.5-15.5 cts/lb (del)
Propylene — Chemical grade	DM610-620/m.t. (cif)	13-14 cts/lb (del)
Polymer grade	DM640-660/m.t. (cif)	14.5-15 cts/lb (del)
Butadiene	$220-230/m.t. (fob)	14 cts/lb (cif)
Benzene	$380-390/m.t. (fob)	$1.19-1.20/gal (fob)
Toluene	$295-305/m.t. (fob)	93-96 cts/gal (fob)
Xylenes — Virgin	$290-300/m.t. (cif)	
Solvent	$290-300/m.t. (fob)	92-95 cts/gal (fob)
Para-xylene	$380-390/m.t. (fob)	18-19 cts/lb (fob)
Ortho-Xylene	$355-365/m.t. (fob)	17-18 cts/lb (fob)
Styrene — T1	$510-520/m.t. (fob)	
T2	$540-550/m.t. (fob)	23-24 cts/lb (fob)
Methanol — T1	$95-100/m.t. (cif)	
T2	DM160-170/m.t. (fob)	36-38 cts/gal (fob)
MTBE	$335-345/m.t. (fob)	85-88 cts/gal (fob)
Phenol	$400-410/m.t. (fob)	19-22 cts/lb (fob)
VCM	$290-300/m.t. (fob)	18 cts/lb (fob)
Fibre Intermediates		
Ethylene glycol	$335-345/m.t. (fob)	16-17 cts/lb (fob)
Acrylonitrile	$630-640/m.t. (fob)	$600-640/m.t. (fob)
Solvents		
IPA	DM810-850/m.t. (del)	22-24 cts/lb (fob)
MEK	DM750-780/m.t. (del)	27-32 cts/lb (fob)
Acetone	DM650-690/m.t. (del)	16-20 cts/lb (fob)
Ethyl acetate	DM1,240-1,300/m.t. (del)	36-38 cts/lb (fob)
Butyl acetate	DM1,230-1,260/m.t. (del)	36-37 cts/lb (fob)

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	App sailin (5
			JNPT PORT (NHAVA SHEVA)	
25/6	Mazyunah (V-16/92)	Oceanic/	Jeddah; P. Said; Trieste; Venice; Rijeka; Koper & Mediterranean Ports. Annaba/Oran (Algiers). (Carting at 3B Kalamboli).	27/
		L. Triest	Trieste; Piraeus; Istanbul; Izmir; Mersin; Alexandria; Beirut; Limassol; Malta; Budapest; Venice; Ravenna; Ancona. (Carting at Kalamboli Shed No. 4B).	
25/6	Mazyunah (V-16/92)	Oceanic	New York; Baltimore; Philadelphia; Chicago; Boston; Norfolk; Atlanta; Charleston; Savannah; Miami; Houston and other inland destinations in U.S. East Coast; Montreal & Toronto. (Carting at 3B Kalamboli).	27/
25/6	Mazyunah	L. Triest	Lagos; Tema; Abidjan; Dakar; Douala; Pointe Noire. (Carting at Kalamboli No. 4B).	27/
			BOMBAY PORT	
22/6	Ever Bridge (Pan) (Voy-617)	Greenways	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon;Manchester; Avonmouth; Bremen; Belfast & all Destinations in U.K.; Germany; Switzerland; Austria & Scandinavian Ports. (Carting at CFS Cotton Avenue).	25/
		Arebee/	P. Said; Alexandria; Piraeus; Venice; Trieste; Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Ravenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). (Carting at M.O.D. No. 1).	
		M.C.S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapest; Russia. (Carting at M.O.D. No. 2).	
		J. Mackintosh/	Aqaba; Hodeidah; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
		P&O	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo;Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at T.P. No. 4).	
25/6	Ilovik (V-16) (Cyp)	P&O	Assab; Djibouti; P. Sudan. (Carting at Timber Pond No. 4).	27/6
25/6	Lanka Abhaya (V-27/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. and Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	28/6
25/6	Baltik	Oceanic	Jeddah (Aqaba); Tunis; Rijeka.	30/6
3/7	Robert E Lee	M.S.P.L.	Assab. (Carting at P/Q-PD).	3/7
25/6	Ilovik	P&O	Colombo. (Carting at Timber Pond No. 4).	27/6
13/6	Rigal	Associate	Colombo.	25/6
Stream	Dehkhoda (Ir) (V-14)	J.M. Baxi	Bandar Abbas; Bandar Khomeini. (Carting at E-Grain Depot).	25/6
22/6	New Orleans (V-012) (Nor)	Tai-Pan	Dubai; Bahrain; Kuwait; Jebel Ali; Sharjah; Ajman; Ras Al Khaimah; Fujairah; Umm Al Quwain; Khorfakkan; Doha; Abu Dhabi; Muscat. (Carting at F.B. No. 1).	25/6
22/6	Ever Bridge (V-617) (Pan)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sancramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas; Various inland destinations. (Carting at CFS Cotton Avenue).	25/6

(1)	(2)	(3)	(4)	(5)
		Marine Trans/	South & Central American Ports. (Carting E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Oakland; New Orleans; San Francisco; S. American Ports. (Carting at M.O.D. No. 2).	
		Arebee/	Halifax; Montreal; Toronto; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tiuana; Veracruze; Mexico; Sao Francis do Sul; Carribbean; Central & South American Ports. (Carting at M.O.D. No. 1).	
		P&O	New York; Baltimore; Norfolk; Savannah; Charleston; Houston; & South American Ports. (Carting at T.P. No. 4 for P&O).	
22/6	Eagle Star (Ger) (Voy-89)	F.F.C. Co.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver (B.C.); New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Chicago; Atlanta; Philadelphia; Milwaukee; Dallas; Guam; St. Louis; Wilmington (B.C.); San Diego; Indianapolis & Central American Ports; Honolulu. (Carting at Timber Pond No. 3).	27/6
26/6	Hoegh Drake (Voy-0414)	Patvolk	Montreal & Toronto via Halifax; New York; Boston; Norfolk; Charleston; Savannah; Wilmington; Philadelphia; Baltimore & FCL Houston; New Orleans; Chicago; Milwaukee; Atlanta; Dallas; Tampico; Mexico City; Veracruz; San Louis; Potossi. (Carting at Hay Bunder No. 5).	28/6
25/6	Cape Ray (V-2206)	E.S.P.L./	Longbeach; Charleston; New York; Norfolk; Oakland; Vancouver; Los Angeles; Seattle; Montreal; Baltimore; Boston; Chicago; Dallas; Houston; New Orleans; Philadelphia; Portland; San Francisco; Halifax; Toronto; Savannah; Miami and all other destinations; S. American and Pacific Ports. (Carting at B-PD).	20/6
		Trident	S. American; Caribbean & Central American Ports. (Carting at 12B-ID).	
3/7	Robert E Lee (USA) (Voy-65)	M.S.P.L.	Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	3/7
25/6	Cape Ray (V-2206)	J. Mackintosh/ Trident	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 2 for J. Mackintosh) (Carting at 12B-ID for Trident).	28/6
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S./	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari	Melbourne; Sydney; Brisbane. (Carting at F.B. No. 3).	
26/6	Zhitomir	Transocean	Australian Ports. (Carting at S.T.P. No. 1).	28/6
25/6	Ilovik (V-16) (Cyp)	Arebee/	Dar Es Salaam & Mombasa (Direct); Re Union; Kampala; Jinja; Torroro; Lugazi; Entebee (Uganda); Kigali (Rwanda); Kitwe; Lusaka; Ndola; Zambia; Lilongwe; Blantyre (Malawi); Maputo; Walvis Bay (Namibia); Zanzibar. (Carting at M.O.D. No. 1).	27/6
		P&O	Mombasa Dar Es Salaam (Direct) Beira; Lugazi; Entebee (Uganda); Kitwe; Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at T.P. No. 4).	
26/6	Gold Hilla (V-71)	Arebee	Lagos; Apapa; Abidjan; Tema (Direct); P. Harcourt; Takoradi; Lome; Cotonou; Douala. (Carting at M.O.D. No. 1).	30/6
22/6	Ever Bridge (V-617)	Greenways/	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohsiung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at CFS Cotton Avenue).	25/6
		M.C.S.	Far East & Japan Ports. (Carting at M.O.D. No. 2).	
22/6	Eagle Star (V-89)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong; Manila; Keelung; Kaohsiung; Main Japan Ports; Tsingtao; Dairen; Quangzhu; Whampoa; Shanghai; Hsingkang. (Carting at T.P. No. 1).	27/6
25/6	Cape Ray (V-2206)	J. Mackintosh/	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang; Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Battar; Yokohama; Nagoya; Kobe; Ho Chi Minh; Main Chinese Ports. (Carting at Frere Basin No. 2).	28/6

(1)	(2)	(3)	(4)	(5)
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 12B-ID).	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at B-PD).	
		Silver Ship/	Far East Ports. (Carting at F.B. No. 1).	
		Beacon/	Far East Main Japan & Chinese Ports. (Carting at E-Shed Grain Depot).	
		Lucky Mari	Singapore; Penang; P. Kelang; Bangkok; Manila; Surabaya; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kaohsiung; Keelung; Busan & Chinese Ports. (Carting at F.B. No. 3).	
26/6	Zhitmir	Transocean	Singapore; Hongkong; Japan and Far East Ports. (Crtg. at S.T.P. No. 1).	28
18/6	Winco Trader	Arcadia	Penang; P. Kelang; Singapore.	25
3/7	Robert E Lee	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	3/
18/6	S/o. Tripura (Ind)	S.C.I.	Singapore; Main Japan Ports; Hualien.	25
17/6	P. Lepshinskiy	Transocean	Kobe; Yokohama; Vladivostock.	25

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
	J.N.P.T. (NHAVA SHEVA)		
25/6	Mazyunah (V-16/92)	Oceanic/L. Triest	Med. Ports & U.S.A.
	BOMBAY PORT		
26/6	Hoegh Drake (V-0414)	Patvolk	Far East
25/6	Ilovik (V-16)	Arebee/P&O	E. Africa
26/6	Lanka Abhaya (V-27/W)	Seahorse	U.K. Cont.
30/6	M. Streakalovskiy	Sai Ship	U.K. Cont.
30/6	S/o. Orissa	S.C.I.	U.K. Cont.

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

DYES & DYE INTERMEDIATES EXPORTED BOMBAY (From 2.4.92 To 5.4.92) (Continued from previous issue)

H ACID: To Buenos Aires: Sandoz (I) Ltd., 4,250 Kgs., Rs. 5,74,465; To Istanbul: Jindal Dye Intermediates P. Ltd., 16,025 Kgs., Rs. 17,67,558; Metro Chem Inds., 10,000 Kgs., Rs. 14,82,200; To Keelung: Vivid Exports P. Ltd., 17,850 Kgs., Rs. 20,13,162.

H ACID MIN 78%: To Hamburg: Sadhana Nitro Chem Ltd., 15,300 Kgs., Rs. 17,20,610.

KAMAZOL BRILL. BLUE: To Antwerp: Western Chemical Co., 1,000 Kgs., Rs. 6,37,348.

MALACHITE GREEN POWDER: To Rotterdam: Ravi Chem Dye, 2,500 Kgs., Rs. 4,14,857.

META CHLORO ANILINE: To Felixstowe: Valiant Chemical Corpn., 5,000 Kgs., Rs. 7,00,000.

METANILIC ACID: To Antwerp: Sandoz (India) Ltd., 5 Mts., Rs. 2,74,276; To Barcelona: Sadhana Nitro Chem Ltd., 7,000 Kgs., Rs. 4,16,740; To Felixstowe: Jeevan Products, 10 Mts., Rs. 6,60,239; To Istanbul: Metro Exporters Ltd., 5,000 Kgs., Rs. 2,46,345; To New York: Atul Products Ltd., 15,000 Kgs., Rs. 6,62,668.

META PHENYLENE DIAMINE SULFONIC ACID: To Keelung: Vivid Exports P. Ltd., 2,575 Kgs., Rs. 3,41,757.

6 NITRO 1 DIAZO 2 NAPHTHOL 4 SULPHONIC ACID: To Buenos Aires: Sandoz (I) Ltd., 1,447 Kgs., Rs. 1,98,227.

ORTHO TOLUIDINE BASE: To Buenos Aires: Sandoz (I) Ltd., 1,449 Kgs., Rs. 1,78,279.

PARA NITRO CHLORO ANILINE: To New York: Anil Dyechem Inds. P. Ltd., 2,000 Kgs., Rs. 3,57,639.

PERMANENT ORANGE G: To Karachi: Colour Chem Ltd., 1,000 Kgs., Rs. 2,54,200.

PHTHALOCYANINE BLUE: To Port Said: Sudarshan Chemical Inds. Ltd., 2 Mts., Rs. 6,53,913.

PHTHALOCYANINE GREEN: To Colombo: Colour Chem Ltd., 400 Kgs., Rs. 74,174.

PHTHALOCYANINE GREEN GN: To Hamburg: Colour Chem Ltd., 7 Mts., Rs. 22,56,456.

PHTHALOCYANINE GREEN GNX: To Rotterdam: Colour Chem Ltd., 5,800 Kgs., Rs. 20,10,815.

PIGMENT DYES: To Dammam: Bhimrajka Impex P. Ltd., 220 Kgs., Rs. 1,60,612.

PIGMENT GREEN: To Genoa: Gujarat Inds., 3,000 Kgs., Rs. 8,97,631.

REACTIVE BLACK: To Felixstowe: Space International, 10,000 Kgs., Rs. 17,56,475.

REACTIVE BLACK B: To Karachi: Colour Chem Ltd., 4,975 Kgs., Rs. 5,32,275.

REACTIVE BLUE SYNTHETIC: To Karachi: Colour Chem Ltd., 500 Kgs., Rs. 1,14,125.

REACTIVE BRILL. ORANGE: To Karachi: Colour Chem Ltd., 250 Kgs., Rs. 41,760; 500 Kgs., Rs. 83,810.

REACTIVE BRILL. VIOLET: To Karachi: Colour Chem Ltd., 500 Kgs., Rs. 86,475.

REACTIVE ORANGE 16, RED, YELLOW: To Felixstowe: Megha Impex P. Ltd., 750 Kgs., Rs. 1,43,164.

REACTIVE RED HE: To New York: Sona Dye Chem, 1,000 Kgs., Rs. 2,03,629.

REACTIVE TURQUOISE BLUE: To Karachi: Colour Chem Ltd., 400 Kgs., Rs. 53,625; 400 Kgs., Rs. 64,600; 1,000 Kgs., Rs. 1,33,800; 3,000 Kgs., Rs. 4,02,113.

REACTIVE YELLOW FG: To Karachi: Colour Chem Ltd., 950 Kgs., Rs. 1,04,940; 2,000 Kgs., Rs. 1,89,500.

R H ACID: To Istanbul: Gokul Enterprise, 3,000 Kgs., Rs. 4,38,011.

R SALT: To New York: Atul Products Ltd., 4,300 Kgs., Rs. 3,33,104.

SCARLET CHROME: To Dar-es Salam: United Breweries Intl., 1,500 Kgs., Rs. 1,59,994; To Port Said: Sudarshan Chem Inds. Ltd., 1 Mt., Rs. 83,197.

SULPHANILIC ACID: To Busan: Kokan Synthetics, 23 Mts., Rs. 7,19,906.

SUPRA TURQ. H 2 GP: To Alexandria: Jaysynth Dyechem Ltd., 450 Kgs., Rs. 1,21,105.

TOLUIDINE RED: To Colombo: Sudarshan Chemical Ind. Ltd., 500 Kgs., Rs. 1,24,671.

ULTRAMARINE BLUE: To Beirut: Haji Busain Tale Lari, 50 Kgs., Rs. 4,433.

VAL BLUE: To Rotterdam: Amar International, 500 Kgs., Rs. 2,70,000.

VAR GREEN: To Rotterdam: Amar International, 2,000 Kgs., Rs. 12,00,000; Karsandas Mavji, 600 Kgs., Rs. 3,60,992.

VINYL SULPHONE: To New York: JBF Inds. Ltd., 18,000 Kgs., Rs. 19,61,491.

VINYL SULPHONE MW: To Gdynia: Monarch Dyestuff Inds., 9,448 Kgs., Rs. 9,11,881.

MATERIALS EXPORTED BOMBAY
(From 6.4.92 To 10.4.92)

ALKALINE SODIUM SILICAT LIQUID: To Mina Qaboos, Met Exporters Ltd., 200 Mts., R 13,61,921.

ALUMINIUM SULPHATE: T Colombo: The Dharamsi Morar Chemical Co., 400 Mts., Rs. 10,16,76

AMMONIUM CHLORIDE: To Sin gapore: UGS Intl., 10,000 Kgs., R 60,000.

CALCIUM LACTATE: To Lyttle ton: Indl. Trading Co., 1,500 Kgs Rs. 67,000.

CARBOXY METHYL CELLU LOSE: To Dammam: Ashok Organi Inds. Ltd., 14,000 Kgs., Rs. 3,45,532

CHRYSOPHENINE G: To Hon Kong: M B Industrial Corpn., 3,00 Kgs., Rs. 3,20,000.

CYPERMETHRIN: To Kelang Gupta Chemicals P. Ltd., 6,408 Kgs. Rs. 6,21,700.

CYPERMETHRIN TECH.: To Bangkok: United Phosphorus Ltd. 2,000 Kgs., Rs. 20,01,858; To Gdansk United Phosphorus Ltd., 150 Kgs., Rs 1,37,645; To Kaohsiung: Gharda Chemicals Ltd., 8 drums, Rs. 2,12,980

CYPERMETHRIN TECH 92% MIN: To Bangkok: United Phosphorus Ltd., 500 Kgs., Rs. 5,20,078.

DI NITRO CHLORO BENZENE: To Barcelona: Chemie Synth Ltd., 2 Ctn., Rs. 8,62,114.

DIPHENHYDRAMINE: To Hong Kong: Industrial Trading Co., 200 Kgs. Rs. 82,000.

GLYPHAGATE TECHNICAL: To Kaohsiung: Excel Industries Ltd., 360 Kgs., Rs. 39,34,063.

GUARGUM: To Lyttelton: Indian Gum Industries Ltd., 20,000 Kgs., Rs. 4,15,570.

Gum: To Buenos Aires: Indian Gum Inds. Ltd., 80 Kgs., Rs. 1,09,368.

GUM RESIST SALT: To Chittagong: Prashant Proteins Ltd., 15 Mts., Rs. 4,21,110.

HYDROCHLORIC ACID: To Colombo: Grasim Inds. Ltd., 1,120 Nos., Rs. 1,37,633; To Singapore: Grasim Inds. Ltd., 76.8 Mts., Rs. 2,44,688.

IRON OXIDE RED: To Belawan: Selective Minchem & Colour Inds., 840 Kgs., Rs. 1,13,312.

MALATHION: To Chittagong: Rallis India Ltd., 75 Drums, Rs. 7,72,960.

METHYL NITRO IMIDAZOLE: To Gdynia: Unichem Laboratories Ltd., 10,000 Kgs., Rs. 22,42,000.

PHENYTOIN BASE: To Hamburg: Euresian, 500 Kgs., Rs. 1,14,974.

PHTHALIC ANHYDRIDE: To Chittagong: Mysore Petrochemicals Ltd., 18 Mts., Rs. 3,10,846; To Colombo: Asian Paints Ltd., 760 Kgs., Rs. 3,28,540; To Dubai: Asian Paints Ltd., 38,000 Kgs., Rs. 6,48,438; To Tokyo: Mysore Petrochemicals Ltd., 720 Kgs., Rs. 2,91,730.

QUINAL PHOS TECH.: To Bangkok: Gujarat Insecticides Ltd., 5,000 Kgs., Rs. 16,50,000.

SODIUM META NITROBENZENE: To Barcelona: Sadhana Nitro Chem Ltd., 268 Kgs., Rs. 2,84,275.

SODIUM PENTACHLORO PHENOL 85% MIN: To Singapore: Chika Ltd., 15,000 Kgs., Rs. 7,20,321.

UNDECYLENIC ACID BP: To Marscilles: Jayant Oil Mills, 21.340 Mts., Rs. 29,51,015.

DRUG MATERIALS EXPORTED BOMBAY (From 6.4.92 To 10.4.92)

AMOXYCILLIN TRIHYDRATE: To Copenhagen: Kopran Ltd., 3,000 Kgs., Rs. 59,90,000.

CIMETIDINE: To Colombo: Torrent Exports Ltd., 13 Ctr., Rs. 1,90,000.

DIMETRIDAZOLE: To Veracruz: Euresian: 1,000 Kgs., Rs. 3,26,915.

DRUG INTERMEDIATE: To Marseilles: Metro Exporters Ltd., 8,750 Kgs., Rs. 29,76,568.

ERYTHROMYCIN ESTOLATE BP 88: To Vietnam: Mehta Pharmaceuticals Inds., 548.70 Kgs., Rs. 8,63,000.

ETHAMBUTOL HCl BP: To La Valetta: Lapin Intl., 2,000 Kgs., Rs. 16,56,739.

IBUPROFEN BP: To Bangkok: Sumitra Pharmaceuticals & Chemicals, 30 Drums, Rs. 2,76,562.

ISONIAZID: To Manila: Ipca Laboratories Ltd., 20 Drums, Rs. 2,46,696.

MENTHOL BP: To Seattle: Sharp Menthol P. Ltd., 9,000 Kgs., Rs. 25,21,125.

MENTHOL CRYSTALS: To Hong Kong: Bhagat Impex P. Ltd., 80 Drums, Rs. 6,72,000.

METRONIDAZOLE BENZOATE IP: To Copenhagen: Manjarati Chemicals, 1,400 Kgs., Rs. 6,88,461; To Hamburg: Manjarati Chemicals, 2,700 Kgs., Rs. 13,55,590.

OXYPHENBUTAZONE BP: To Veracruz: Euresian, 150 Kgs., Rs. 1,39,092.

PARACETAMOL: To Lagos: Amrit International Ltd., 21,035 Kgs., Rs. 28,05,032.

POTASSIUM IODIDE BP: To Lyttelton: G. Amphray Laboratories, 600 Kgs., Rs. 1,63,259.

PROCAINE PENICILLIN: To Lagos: Hindustan Antibiotics Ltd., 9,558 Kgs., Rs. 17,10,069.

RAFOXANIDE BP VET: To Genoa: Gharda Chemicals Ltd., 10 Drums, Rs. 14,04,627.

SALBUTAMOL: To Dubai: Glenmark Pharmaceuticals P. Ltd., 6,000 Pcs., Rs. 1,08,048; To Singapore: Torrent Exports Ltd., 434 Kgs., Rs. 88,872; To Sydney: Torrent Exports Ltd., 867 Kgs., Rs. 1,92,409.

SALBUTAMOL BP: To Singapore: Torrent Exports Ltd., 2,023 Kgs., Rs. 4,51,000.

SULPHAMETHOXAZOLE: To Jakarta: Anant & Co., 100 Drums, Rs. 15,13,122; To Singapore: Apte Amalgamations Ltd., 200 Drums, Rs. 30,36,432.

SULPHAMETHOXAZOLE BP: To Cophenhagen: Cibatul Ltd., 10,000 Kgs., Rs. 29,06,635; To Hong Kong: Priya Chemicals, 280 Drums, Rs. 19,11,622; To Manila: Ipca Laboratories Ltd., 1,500 Kgs., Rs. 4,86,079.

TRIMETHOPRIM: To Barcelona: Chemox Marketing Associates Ltd., 40 Drums, Rs. 8,30,031.

PLASTIC MATERIALS EXPORTED BOMBAY (From 6.4.92 To 10.4.92)

LDPE: To Chittagong: Indian Petrochemicals Corpn. Ltd., 82.500 Mts., Rs. 14,95,899; To Colombo: Indian Petrochemicals Corpn. Ltd., 660 Kgs., Rs. 2,99,180; To Singapore: Indian Petrochemicals Corpn. Ltd., 16.500 Mts., Rs. 2,99,180.

POLYETHYLENE: To Hong Kong: Indian Petrochemicals Corpn. Ltd., 11,880 Kgs., Rs. 52,36,182.

PVC RESIN: To Dubai: Lightchft Corpn., 5,745 Kgs., Rs. 4,04,300.

DYES & DYE INTERMEDIATES EXPORTED BOMBAY (8.4.92)

ACID BLUE, ACID VIOLET, ACID ORANGE: To Buenos Aires: J K Promotions, 1,700 Kgs., Rs. 3,00,000.

ACID DYES: To Sydney: Sandoz (I) Ltd., 1,000 Kgs., Rs. 2,23,161.

ACTIVE YELLOW: To Karachi: Asian Dyestuff Industries, 1,100 Kgs., Rs. 1,30,267.

ALPHA BLUE: To Perak Surab: Deepak Intl., 500 Kgs., Rs. 1,00,000.

AURAMINE: To Melbourne: Navin Chemical Enterprises, 1,000 Kgs., Rs. 1,42,620; To Sydney: Navin Chemical Enterprises, 900 Kgs., Rs. 2,01,629.

CHROME PIGMENT: To Melbourne: Sudarshan Chemical Inds. Ltd., 1,000 Kgs., Rs. 59,149.

CHROMOCYANINE GREEN: To Melbourne: Sudarshan Chemical Inds. P. Ltd., 500 Kgs., Rs. 58,956.

DIAMINO STILLBENE DISULPHONIC ACID: To Le Havre: Hicksons & Dadajee Ltd., 9,600 Kgs., Rs. 20,09,568; To Tokyo: Manju Intermediates, 2,082 Kgs., Rs. 2,88,129.

DIMETHOXY DIBENZANTHRONE: To Bangkok: Indian Dyestuff Inds. Ltd., 2,000 Kgs., Rs. 12,34,000.

DIRECT TURQUOISE BLUE FBL: To Bangkok: Jay Chemical Inds., 2,000 Kgs., Rs. 4,00,000.

DYEING AND TANNING AGENTS: To Chittagong: Golden Chemicals Ltd., 400 Kgs., Rs. 2,95,055.

DYE INTERMEDIATE: To Bangkok: Indian Dyestuff Industries Ltd., 8 Drums, Rs. 3,96,000; 80 Kgs, Rs. 12,90,000; Sajjan Impex Ltd., 86 Kgs., Rs. 3,20,321; To Barcelona: Sudha Inds. Corpn., 15 Kgs., Rs. 3,87,106; 127 Kgs., Rs. 7,60,770; To Busan: Agarwal International, 47 Kgs., Rs. 3,36,889; To Indonesia: Shree Raj Exports, 2,300 Kgs., Rs. 3,00,540; To Istanbul: Meghmani Dyes & Intermediates, 55 Kgs., Rs. 6,78,764; To Jakarta: Shree Raj Exports, 200 Kgs., Rs. 25,267; 4,300 Kgs., Rs. 5,58,471.

DYE INTERMEDIATE: To Piraeus: Monarch Dyestuffs Inds., 65 Kgs., Rs. 5,20,848; To Yokohama: Atul Products Ltd., 4,230 Kgs., Rs. 15,26,772.

DYES: To Bangkok: Indian Dyestuff Inds. Ltd., 13 Drums, Rs. 3,12,000; 43 Drums, Rs. 12,14,000; To Barcelona: Ravi Chem Dye, 40 Drums, Rs. 1,65,370; To Busan: Indian Dyestuff & Chemicals, 1,000 Kgs., Rs. 1,45,450; 1,000 Kgs., Rs. 1,87,007; To Charleston: Chemiequip Ltd., 40 Drums, Rs. 2,20,363; To Chicago: Kabbur Industries P. Ltd., 300 Kgs., Rs. 71,201; To Chittagong: Bhagwanlal Tejaji Kharawala, 40 Drums, Rs. 2,79,818; Ditex Dyechem Inds., 40 Drums, Rs. 1,12,897; Textile Dyes Inds., 400 Drums, Rs. 5,20,000; To Dubai: Castlon Colour Chem Industries, 2,000 Kgs., Rs. 87,270.

DYES: To Dubai: Gujarat Tobacco Co., 1,500 Kgs., Rs. 60,950; Jasmine Chemical Inds., 960 Drums, Rs. 1,37,11,040; To Genoa: H & H International, 10 Drums, Rs. 1,43,501; To Hong Kong: Kabbur Industries P. Ltd., 1,500 Kgs., Rs. 3,59,468; Roha Dyechem P. Ltd., 25 Kgs., Rs. 28,500; 39 Drums, Rs. 2,50,000; To Istanbul: Devarsons P. Ltd., 82 Drums, Rs. 5,10,000; 300 Kgs., Rs. 60,000; Krishnakant Intl., 20 Drums, Rs. 2,77,046; To Jakarta: Indian Dyestuff & Chemicals, 500 Kgs., Rs. 99,737; To Karachi: Asian Dyestuff Industries, 1,575 Kgs., Rs. 2,10,112; 5,500 Kgs., Rs. 8,00,926; 8 Mts., Rs. 8,01,727; Atlas Dye Chem Inds., 500 Kgs., Rs. 1,03,278; Chemex Works, 425 Kgs., Rs. 51,830; 1,325 Kgs., Rs. 1,61,317; Chemiequip Ltd., 40 Drums, Rs. 1,15,124; 54 Drums, Rs. 1,93,863; Indiana Intl., 725 Kgs., Rs. 87,300; M M Inds., 3,725 Kgs., Rs. 3,51,448; Sandoz (I) Ltd., 5 Mts., Rs. 5,89,000; To Keelung: Ashish Chemicals, 120 Drums, Rs. 8,17,288; Dalal Vadilal Maneklal Dyechem, 460 Drums, Rs. 14,84,970; Ekta International, 100 Drums, Rs. 5,74,200; Kantilal Sanghvi & Co., 60 Drums, Rs. 3,35,000; To Kobe: Jay Chemical Inds., 60 Drums, Rs. 10,00,000; 120 Drums, Rs. 5,40,000; To Lagos: Jaysynth Dyechem Ltd., 9,850 Kgs., Rs. 31,57,917; To Manila: Roha Dyechem P. Ltd., 24 Drums, Rs. 1,22,000; R.P. Trading Co., 80 Drums, Rs. 2,93,670; To Miami: Ram Gum & Chemicals, 40 Drums, Rs. 4,39,119; 40 Drums, Rs. 4,68,209; To New York: Coopers Exports, 1,500 Kgs., Rs. 3,77,337; To Piraeus: Royal Chem Inds., 56 Drums, Rs. 5,09,766; To Tilbury: Ravi Chem Dye, 3,000 Kgs., Rs. 4,99,082.

FLUORESCENT BLUE: To Melbourne: Sudarshan Chemical Inds. P. Ltd., 250 Kgs., Rs. 48,206.

FLUORESCENT ORANGE: To Auckland: Sudarshan Chemical Inds. Ltd., 50 Kgs., Rs. 8,727.

GAMMA ACID: To Busan: Sajjan Impex Ltd., 110 Kgs., Rs. 7,22,986; To Keelung: Priya Electronics & Chemicals, 450 Kgs., Rs. 58,340; 4,775 Kgs., Rs. 6,57,526.

GOLDEN YELLOW RH: To Karachi: Chemiequip Ltd., 106 Drums, Rs. 5,36,605.

H ACID: To Istanbul: Ordia Chemicals P. Ltd., 15,475 Kgs., Rs. 17,61,200; To Yokohama: The Malwa Vanaspati & Chemicals, 5 Kgs., Rs. 3,22,544.

LEMON CHROME: To Melbourne: Sudarshan Chemical Inds. Ltd., 1,000 Kgs., Rs. 56,656.

MALACHITE GREEN: To Hamburg: Ravi Chem Dye, 200 Kgs., Rs. 31,659.

METANILIC ACID: To Istanbul: Rohan Exports Ltd., 103 Kgs., Rs. 2,26,957.

NITCID MILLING MAROON: To Rotterdam: Kach & Hem Inds., 2 Mts., Rs. 3,21,969.

OPTICAL BRIGHTENING FLUORESCENT: To Tanjung: Indian Dyestuff Inds. Ltd., 2,000 Kgs., Rs. 3,40,100.

OPTICAL WHITENING AGENT: To Hamburg: Diamond Dye Chem P. Ltd., 210 Kgs., Rs. 51,489.

ORGANIC PIGMENTS: To Hong Kong: Indian Dyestuff Inds. Ltd., 320 Drums, Rs. 15,58,000; To New York: Gujarat Industries, 9 Mts., Rs. 22,71,782.

PHTHALOCYANINE GREEN: To Sydney: Sudarshan Chemical Inds. Ltd., 1,000 Kgs., Rs. 3,77,008.

REACTIVE DYES: To Chittagong: Amritlal Chemaux Ltd., 1,000 Kgs., Rs. 1,14,823.

REACTIVE ORANGE: To Chittagong: Gateway International, 2,000 Kgs., Rs. 3,56,000.

REACTIVE VIOLET SR: To Charlotte: Indian Export Trading Co., 2 Mts., Rs. 4,42,720.

RED HE 8B: To Buenos Aires: Western Chemicals Co., 1,000 Kgs., Rs. 2,90,870.

SHREE ACTIVE RED EP 7B: To Hong Kong: Shree Dye Chem, 300 Kgs., Rs. 60,790.

SHREE ACTIVE YELLOW VGN: To Hong Kong: Shree Raj Exports, 475 Kgs., Rs. 92,741.

SULPHANILIC ACID: To Barcelona: Caffil P. Ltd., 360 Kgs., Rs. 4,50,000.

TURQUOISE BLUE: To Chittagong: Amritlal Chemaux Ltd., 500 Kgs., Rs. 57,428.

TURQUOISE BLUE HA: To Buenos Aire: Valia Chemicals P. Ltd., 2,000 Kgs., Rs. 4,80,000.

VALIACTIVE BLACK HFGR: To Buenos Aires: Valia Chemicals P. Ltd., 1,000 Kgs., Rs. 1,95,000.

VALIACTIVE GOLDEN YELLOW: To Buenos Aires: Valia Chemicals P. Ltd., 1,200 Kgs., Rs. 2,07,000.

VALIACTIVE ORANGE: T Buenos Aires: Valia Chemicals P. Ltd 500 Kgs., Rs. 1,54,000.

VALIACTIVE YELLOW HE4G: T Buenos Aires: Valia Chemicals P. Ltd 700 Kgs., Rs. 1,32,000.

VAT DYES: To Chittagong: Amritlal Chemaux Ltd., 600 Kgs., R 4,18,570.

VIOLET: To Rotterdam: Ravi Chem Dye, 5,000 Kgs., Rs. 9,33,882.

MATERIALS IMPORTED BOMBAY (1.5.92)

ACRYLAMIDE: From Japan Mafatlal Inds. Ltd., 3,000 Kgs., Rs 1,23,868.

ALAMINE 336: From USA: Ballarpur Inds. Ltd., 653 Kgs., Rs. 1,37,043

ALPHA AMYLASE: From Japan Advanced Biochemicals P. Ltd., 50(Kgs., Rs. 3,32,299.

ALUMINIUM OXIDE: From Netherlands: Orient Abrasives Ltd., 20 Mts., Rs. 6,63,915.

3 CHLORO 4 FLUORO ANILINE: From Germany: Cipla Ltd., 5,000 Kgs., Rs. 27,79,088.

2 CYANO 4 NITRO ANILINE: From Japan: Nirup Synchronae Ltd., 825 Kgs., Rs. 2,38,446.

DIMETHYL FORMAMIDE: From Germany: Cipla Ltd., 14,820 Kgs., Rs. 4,70,698; R.K. Chemicals, 14,820 Kgs., Rs. 4,70,698.

GAMMA FERRIC OXIDE: From China: Prakash Inds. Ltd., 15 Mts., Rs. 17,15,094.

GLUCOMYLASE: From USA: Advanced Biochemicals P. Ltd., 1,600 Ltrs., Rs. 2,56,629.

HEXACHLOROCYCLOPENTADIENE: From USA: Excel Inds. Ltd., 190.511 Mts., Rs. 91,92,936.

8-HYDROXYQUINOLINE: From Japan: Kirti Drugs P. Ltd., 500 Kgs., Rs. 2,30,267.

META TOLUENE DIAMINE: From Germany: Inkemex India Ltd., 5,000 Kgs., Rs. 3,17,277.

MICROCRYSTALLINE WAX: From Netherlands: Astron Corpn., 39.680 Mts., Rs. 6,83,044; Schemiefine, 1,616 Mts., Rs. 15,15,936.

NAPHTHALENE CRUDE: From Australia: Amar Dye Chem Ltd., 307.36 Mts., Rs. 22,68,008; From Japan: Shree Yogvishal Chem Ltd., 96,000 Kgs., Rs. 10,96,234.

ORTHO CHLORO BENZALDEHYDE: From Japan: Morepen Labs. P. Ltd., 1,150 Kgs., Rs. 1,94,722.

POLYVINYL PYRROLIDONE: From USA: Roche Products Ltd., 798 Kgs., Rs. 3,23,728.

RED PHOSPHORUS: From China: Agrosynth Chemicals, 42 Kgs., Rs. 16,65,162.

SULPHUR HEXAFLUORIDE: From USA: Asia Brown Boveri I. Ltd., 50 Pcs., Rs. 6,98,500.

TITANIUM DIOXIDE: From Australia: S C J Plastics P. Ltd., 20,000 Kgs., Rs. 10,16,352.

TRIMETHYLOL PROPANE: From Sweden: Hindustan Ciba Geigy Ltd., 2000 Kgs., Rs. 1,11,163.

TRIMETHYL PHOSPHATE: From USA: Lupin Labs. Ltd., 15,480 Kgs., Rs. 11,30,819.

PLASTIC MATERIALS IMPORTED BOMBAY (1.5.92)

HDPE: From Korea: Arm Group Enterprises Ltd., 32 Mts., Rs. 7,39,480; Bajaj Polymers, 16 Mts., Rs. 3,72,823; Gujarat Packaging, 48 Mts., Rs. 10,70,388; Kanpur Plastipack Ltd., 48 Mts., Rs. 11,32,278; Narmada Extrusions P. Ltd., 16 Mts., Rs. 3,67,437; Unilite Plastic Inds. P. Ltd., 32 Mts., Rs. 7,01,495; Vishal Plastic Inds., 8 Mts., Rs. 1,79,062; From Saudi Arabia: Raheja Plastics, 34.300 Mts., Rs. 8,38,840; From Singapore: EPC Inds. P. Ltd., 17 Mts., Rs. 4,80,122; From USA: Crown Plastic Inds., 17.50 Mts., Rs. 3,66,840; Indochem & Polymers, 8.250 Mts., Rs. 1,70,318; 33 Mts., Rs. 6,81,272; 41.250 Mts., Rs. 8,51,590; Indo Plast, 34 Mts., Rs. 7,36,528; Neo Sack Ltd., 35 Mts., Rs. 7,00,330; Puspha Impex P. Ltd., 17.500 Mts., Rs. 3,50,165; Vishal Plastics, 17.500 Mts., Rs. 3,33,491; From Yugoslavia: Addis Corpn., 15 Mts., Rs. 3,73,092; Creative Plastics P. Ltd., 30 Mts., Rs. 7,45,116; Kapi Chem Dye, 5 Mts., Rs. 1,24,259; Marico Industries Ltd., 50 Mts., Rs. 12,42,230; R.K. Exports, 5 Mts., Rs. 1,24,235.

LDPE: From USA: Vishal Plastomer P. Ltd., 17 Mts., Rs. 2,16,870; From Yugoslavia: Adds Corpn., 9 Mts., Rs. 2,12,380; Arun Investment Corpn., 15 Mts., Rs. 3,53,457; D.S. Mehta & Co., 27 Mts., Rs. 6,44,873; Interplast Inds., 36 Mts., Rs. 8,59,764.

LLDPE: From Canada: Pradeep Plastic Inds., 25 Mts., Rs. 4,60,535; Shriram Chemicals, 16 Mts., Rs. 4,57,358.

POLYETHYLENE: From Thailand: Daniel Philips & Co. P. Ltd., 17 Mts., Rs. 3,79,743.

POLYPROPYLENE: From Belgium: Panorama Plastics, 45 Mts., Rs. 9,31,626; From Brazil: Metro Dyechem (I) Ltd., 15,000 Kgs., Rs. 3,01,669; Ravi International, 200 Mts., Rs. 40,33,320; Shri Hanuman Overseas Corpn., 9 Mts., Rs..1,81,850; The Supreme Industries Ltd., 87 Mts., Rs. 17,03,441; 93 Mts., Rs. 18,76,100; From Korea: Naresh Paper Bag Co., 27 Mts., Rs. 5,84,640; Sidharth International, 15.5 Mts., Rs. 3,17,035; From Singapore: Metro Dyechem (I) Ltd., 24 Mts., Rs. 4,47,.603; From USA: Plasto Metachem India P. Ltd., 16.250 Mts., Rs. 2,56,112.

PVC RESIN: From Brazil: Mayank Chemi Plast P. Ltd., 153 Mts., Rs. 25,85,615; Patram Industries, 50 Mts., Rs. 8,44,350.

PVC RESIN: From Brazil: Vikas Polymers, 50 Mts., Rs. 8,44,266; From Greece: Movilex Polymers P. Ltd., 60 Mts., Rs. 9,17,817; From Korea: Parsholex Agroplast P. Ltd., 51 Mts., Rs. 8,95,018; The Supreme Industries Ltd., 510 Mts., Rs. 58,45,122; From USA: Cipla Ltd., 99.80 Kgs., Rs. 67,167; 499 Kgs., Rs. 2,30,286.

SYNTHETIC RESIN: From USA: Midland Plastics Ltd., 40 Mts., Rs. 7,26,820; Shah Indl. Corpn., 17 Mts., Rs. 2,69,969; Srinivas Synthetic Packer P. Ltd., 18.4 Mts., Rs. 3,34,456.

MATERIALS IMPORTED BOMBAY (4.5.92)

AMMONIA CATALYST: From Denmark: National Fertilisers Ltd., 9,860 Kgs., Rs. 15,34,688.

2B ACID TECH: From Korea: Sudarshan Chemical Inds., 2,931 Kgs., Rs. 4,84,876.

BUTYL ACRYLATE MONOMER: From Japan: Gupta Trading Co., 14,400 Kgs., Rs. 4,71,079; Parshwanath Chem., 14,400 Kgs., Rs. 4,91,660.

CAPROLACTAM: From Poland: J. K. Synthetics Ltd., 107.100 Mts., Rs. 49,39,526.

CARBON BLACK: From Germany: Drillo Metal Carbides Ltd., 1,000 Kgs., Rs. 59,610.

DIETHYL CARBONATE: From France: Indian Petrochem Corpn. Ltd., 2,000 Kgs., Rs. 6,70,157.

DIETHYL CARBONATE 99.6% MIN: From France: Kantilal Manilal & Co., 2,880 Kgs., Rs. 2,77,378.

DIMETHYL CARBONATE 99.6% MIN: From France: Kantilal Manilal & Co., 12,000 Kgs., Rs. 6,93,446.

EPICHLOROHYDRIN: From Germany: Chemo India, 4,140 Kgs., Rs. 1,61,623.

ETHYL ACETO ACETATE: Fr USA: Cadila Laboratories Ltd., 19, Lbs., Rs. 5,56,491.

ETHYLENE ACRYLIC AC From Belgium: Essel Packaging Lt 15,500 Kgs., Rs. 9,59,977.

HEPTACHLOR TECH: From US Pesticides India Ltd., 15,840 Kg Rs. 17,60,830.

IODINE: From Japan: Nirav Labor tories P. Ltd., 1,000 Kgs., Rs. 3,11,25 Proto Chemical Industries, 1,000 Kg Rs. 3,11,258.

LITHOPONE 28-30%: From Chin Chemical Corporation, 10,500 Kgs., R 1,11,719; Shah Corporation, 10,50 Kgs., Rs. 1,11,719.

METHYL CELLULOSE: From UK Kantilal Manilal & Co., 500 Kgs., R 1,08,015.

NAPHTHALENE CRUDE: From Japan: Siddharth Colorchem P. Ltd 96,000 Kgs., Rs. 12,92,802.

PARAFORMALDEHYDE: From Spain: Arnath Credit & Commerce 18,000 Kgs., Rs. 2,64,410.

PARAFORMALDEHYDE 96% PRILLS: From Spain: Montari Inds Ltd., 18 Mts., Rs. 2,71,556.

PENTAERYTHRITOL: From Italy Indian Petrochemicals Corpn. Ltd. 17.500 Mts., Rs. 50,25,035.

POLYVINYL PYRROLIDONE: From Germany: Franco-Indian Pharmls. Ltd., 100 Kgs., Rs. 47,111; Griffon Laboratories Ltd., 300 Kgs., Rs. 1,41,333.

SODIUM CARBOXY METHYL CELLULOSE: From France: Mul Health Care Products P. Ltd., 2,000 Kgs., Rs. 3,37,351.

SULPHUR LIGHT YELLOW: From China: S. F. Chemicals Industries P. Ltd., 1,000 Kgs., Rs. 61,934.

TOLUENE DIISOCYANATE: From Italy: Bharat Petrofoam Co. P. Ltd., 19,000 Kgs., Rs. 11,76,745.

TRICYCLODECAN DIMETHYLOL: From Germany: Hindustan Lever Ltd., 180 Kgs., Rs. 84,030.

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Fine Chemicals — Contact and Custom Manufacturing Facilities Abroad

THE introductory note to the marketing supplement on fine chemicals in *Chemistry in Britain* (February 1992) begins as under:

Roget's Thesaurus offers many approximations to the word "fine", as well as a few phrases in the same connection. In a chemical context, one notices "of the first water" and "worth its weight in gold". The first has to do with purity (originally in the diamond trade) and the second with value consequent upon that purity. Looking into Roget again, one finds the following: excellence, integrity, precious, unalloyed, sterling, standard, true, unimpaired, unadulterated, first class, second to none.

If the cumulative burden of all this is descriptive of the chemicals industry, it is clear that manufacuturers of such products are aiming very high indeed. Well, so are their customers. Whereas the requirements of a "speciality" chemical are often concerned with effect (though nowadays terms overlap), the buyer of a fine chemical specifies a particular substance, and the supplier must deliver precisely what is specified in terms of cheemical structure and purity level. "There nines" is not uncommon: purity warranted to within 0.999 of absolute purity, with some certainty that the umpteenth consignment will be as pure as the first.

Given below are the resume of the range of products offered by renowned manufacturers:

JANSSEN CHIMICA

Semi-bulk specialities

Since 1953 Janssen Pharmaceutical has been a pioneer in the pharmaceutical field. Over 70 original Janssen products have found important applications in medicine. Since 1970, Janssen Chimica has been manufacturing fine chemicals, and their Catalogue, contains more than 12,000 different products.

Contained within Janseen's warehouse are products ranging from highly specialised organic compounds to analytical reagents, in sizes to suit research and development all the way through full-scale industrial production.

Janseen Pharmaceutica has manufacturing plants in Belgium, Ireland, Mexico, Puerto Rico and Spain. Each facility is equipped with multi-purpose reactor vessels and operates under strict GMP and FDA regulations. Every batch produced is closely monitored by quality and process control departments. As a pharmaceutical company Janseen knows how important dependability and consistence are. Before production is begun, of multi-kilogram or even multi-tonne lots, each reaction step is carefully studied in the pilot plant. More than 25 glass lined and stainless steel reactors, which hold from 50-1200 litres, are used for development and testing.

Customer adapted packaging

Because Janseen sell products in quantities for research and industry as well as for laboratory use, they offer packagings in many different sizes ...... often as suggested by their customers.

Handling chemical products of high quality is not easy. Corrosion, flammability, toxicity, Governmental restrictions, temperature considerations, air sensitivity etc., are of major importance in the selection of appropriate packaging. The company will, however, package to customers' specific requirements as regulations permit, in order to reduce delivery time. This in turn enables Janssen's customers to start production or synthesis sooner than they might have thought possible.

Quality a principle concern

Each product manufactured by Janssen Chimica is quality tested at least three times, depending upon the

requirements. Products are always tested to conform to standard specifications (as printed in the catalogue), but if there are specific analytical needs, they will gladly perform custom analyses, ensuring that the product will work for a particular application.

The complete results of the final testing of each product are stored in computer files, from which a certificate of analysis is generated. This certificate, lot-depending, will accompany each shipment.

Environment vs. packaging

Janssen's contribution to preserving the environment is substantial. Everyone who deals in chemical purchasing knows that in many cases, one is forced by prepackaging and stringent sales requirements to purchase substantially more of a given compound than is required.

The excess will remain in the buyer's warehouse for quite some time, tying up his capital and his storage space. After time, he will still be facing the same problem: what to do with the remainder of the material? As an environmental conscious consumer, he will have to have the product disposed of at a premium charge — high prices to be paid by both the customer and the environment.

With this scenario in mind, Janssen Chimica will provide exactly the quantity required and at no extra charge for special packaging. Their concern for protecting the environment goes that far.

EASTMAN FINE CHEMICALS

New Dimensions

Eastman Fine Chemicals brings a new dimension to the worldwide manufacture and marketing of fine chemicals. Whether your requirement is for grams, kilos, tons or thousands of tons, they have a large range of facilities and technologies to meet your needs. Eastman Fine Chemicals gives you access to the capabilities of 3 respected worldwide suppliers of fine chemicals—Sterling Organics, the Kodak Laboratory and Research products Division and the Eastman Chemical Company of Eastman Kodak Company. Because of this range of facilities, Eastman Fine Chemicals can now offer a wide range of services from initial research samples through scale up, test market, to full national or international manufacture.

Eastman Fine Chemicals is a major business organisation in the Eastman Chemical Company, and is organised to serve your needs for laboratory and bulk fi chemicals, custom synthesis, and toll manufactur Eastman's primary markets are the pharmaceutical ar agrochemical industries, the photographic chemical ar electronic materials markets, flavour and fragrance organic and biological laboratory products, and custo synthesis/toll manufacture.

For the pharmaceutical market, Eastman Fine Chemicals offers bulk pharmaceuticals, key intermediates, substantial range of formulation excipients, together wit customs synthesis in USA and Europe in FDA registere plants. In the photographic chemicals market the company offers a range of intermediates and also chemicals for photo finishing.

In the electronic materials market, they offer custom synthesis of photosensitizers, photo polymers, speciality organic chemicals and dyes used in the manufacture of integrated circuit devices and printed circuit boards.

To agricultural chemical producers, Eastman Fine Chemicals offers both intermediates and custom manufacture, together with outstanding plant flexibility in meeting increasing demand as your product market develops. Synthetic products and various intermediates are also available for the flavour and fragrance market.

One of the core strengths offered by EFC is the extensive range and depth of chemistry available within the company. The company's database of reactions contains information on over 500,000 compounds, and the expertise to operate many of these on a commercial scale has been built up from several decades of process development by Kodak, Eastman and Sterling. There are many custom and fine chemical manufacturers but few, if any, have EFC's long experience in multistep, complex, organic synthesis — knowledge gained from years of experience in the manufacture of photochemicals, dyes and pharmaceuticals. Eastman Fine Chemicals have dedicated plant facilities and special expertise in many key unit processes including:

-- Alkylation
-- Acetoacetylation and diketene chemistry
-- Birch and Benzyne chemistry in liquid ammonia
-- Special plants for cyanide and HCN reactions
-- Synthesis of chiral synthons and enzymatic resolution
-- Organometallic chemistry, together with a major facility for low temperature work
-- Friedel Crafts chemistry
-- Halogenation with facilities at several sites to handle bulk bromine, chlorine and iodine

-- Extensive capabilities for both chemical and catalytic reduction, including high pressure facilities in Europe and USA
-- Nitration, oxidation and sulphonation
-- Special polymer synthesis.

Eastman Fine Chemicals is a global company with personnel at key international locations and the major fine chemical markets of the world. The main R & D and pilot facilities in Europe are located at Newcastle, England, and in the USA at Rochester and Rensselaer in New York State, and Kingsport, Tennessee.

EFC's principal manufacturing sites are at Batesville, Arkansas; Kingsport, Tennessee; Rochester annd Rensselaer, New York; and Dudley, England. There are additional Kodak manufacturing facilities at Longview, Texas; Barceloneta, Puerto Rico; Kirkby, England; and Chalon, France.

If your project requires the supply of fine chemicals or custom synthesis from laboratory quantities to multi-thousand tonnes, Eastman Fine Chemicals can help. Their business is designed to start with you at the R&D stage and stay with you through large scale manufacture.

SAF BULK CHEMICALS

From development to manufacturing

SAF Bulk Chemicals combines the manufacturing and sourcing capabilities of Sigma, Aldrich and Fluka Chemical Companies to offer the most comprehensive range of fine chemicals and speciality chemicals and biochemicals in commercial development, and manufacturing quantitles.

Comprehensive range

SAF Bulk Chemicals provides over 70,000 products from stock at its maufacturing and distribution sites worldwide. SAF Bulk Chemicals offers manufacturing expertise in a broad range of key chemicals including reagents for organic synthesis; intermediates for pharmaceuticals, fine and speciality chemical production; fine chemicals for the electronics and specialist paper industries; intermediates for liquid crystal manufacture; and specialist biochemicals, reagents, enzymes, media and immunochemicals for biotechnology, tissue culture, fermentation, immunodiagnostics, biosensor and clinical chemistry.

The company's manufacturing expertise is particularly strong in the production of a range of key chemical and biochemical reagents and intermediates including: albumins and other extracted proteins; boranes; biological buffers; carbohydrates and sugar derivatives; chemical and biological detergents; chiral compounds, enzymes and resolving agents; enzymes for immunodiagnostics and clinical chemistry; fluoroorganics; immuno-chemicals, peptide synthesis, protected amino acids and peptide/protein modification reagents; protecting groups; reducing agents; silylating agents and organo-silica compounds and tissue culture reagents.

Process capabilities

SAF's bulk manufacturing facilities are designed for batch processing from multi-kilo to multi-tonne quantities. Process equipment includes glassteel reactors (50-12,000 litres), pilot-plant scale 316 stainless steel reactors (140-10001), solids filtration (3 to 25 cubic ft), vacuum shelf dryers (20 to 300 sq. ft); vacuum tumble dryers (3 to 70 cubic ft), lyophilisation (to 50 kg), hydrogenation (to 500 psi), vacuum distillation (100 lt @ 100 mm Hg), process temperature range -20°C to 180°C.

Their production staff is experienced in a wide variety of techniques including but not limited to; acylation, alkylation, amination, bioconversion chlorosulfonation, condensation, conjugation, dehydration, diazotisation, esterification, Grignard methods, halogenation, hydroboration, hydrogenation, oxidation, peptide synthesis, phosgenation, quaternisation, reduction, saponification and sulfonation.

Backed by the capacity and reputation for quality and service of Sigma, Aldrich and Fluka, SAF's commitment to its customers doesn't stop at supplying the product. Saf Bulk Chemicals works with customers from development to manufacturing.

With flexibility in mind, SAF also offers a range of services including custom and toll manufacturing, custom product design, dispensing and packaging; charge size quantities; full documentation; GMP manufacturing facilities in Europe and the USA; just-in time delivery and full technical back-up.

FLUKA

World-wide network

Fluka Chemicals Ltd. based at Glossop in Derbyshire, is the British subsidiary of Fluka Chemie AG, Switzerland, and is part of a world-wide network of subsidiary and distribution companies, providing a high speed, high quality sales, distribution and technical back up service for the full range of over 14,000 chemicals and biochemicals offered in the present Fluka Catalogue.

Fluka is known world-wide as a supplier of high quality chemicals and bio-chemicals for research and development and intermediates for industrial manufacture, but this is only part of the picture. The Buchs site offers large scale production facilities, now approved to GMP standard, manufacturing over 4,000 products in quantities from a few grammes to small tonnage. All plant has been specifically designed for multi-purpose usage so it can be easily adapted to many different chemical processes, enabling Fluka to adopt a versatile and flexible approach not only to production but also to specific customer developments in which they are actively seeking to become involved.

Fluka's product line is continually increasing as its own research and development bring new products on stream. The quality of the full product range is assured because Fluka assay every chemical and bio-chemical, and subject all products to exacting tests in their well equipped quality control laboratories. Each product is carefully packed and labelled so that chemists, biochemists, life scientists and laboratory technicians world-wide can rely on "made in Switzerland" quality.

Fluka's philosophy of continual development of both product range and customer service has led over the last 12 months to the company becoming an integral part of the SAF Bulk Chemical Service. This sets out to offer the full range of Fluka products alongside those of Sigma and Aldrich, but at a scale and price more appropriate to the needs of pilot or development plant, clinical trial or production level, while maintaining the very high levels of quality and service for which all three companies are renowned. The company has worked consistently over the years to develop special knowledge and expertise in particular areas e.g. chiral compounds and building blocks; quaternary ammonium compounds for phase transfer catalysis and electrochemistry; silylating agents; a range of products for ion-selective electrode work and a comprehensive range of highly purified reagents for bio-chemistry marked under trade name Micro Select.

HICKSON Fine Chemicals division

Hickson & Welch Limited and Hickson Danchem, Hickson International's US-based organic chemical operation, combined to form the Hickson Fine Chemicals Division.

Hickson & Welch Led. is a world leader in nitration technology, with expertise in sulphonation, chlorination, phosgenation, catalytic hydrogenation, heterocyclic chemistry plus other techniques. Their new phosgenation unit and phosgene generator is now on-stream, capable of high temperature, reactions to 200°C. Bot this plant and their 2nd Buss catalytic hydrogenatio loop are accredited with BS 5750/ISO 9002. This stand ard is to be extended site-wide. Some contract mar ufacturing areas are already covered. With a busines base complementary to Hickson & Welch, manufactu ing a wide range of polymerisation products and hig value compounds, Hickson Danchem also places par ticular emphasis on custom/toll manufacturing and pro duction flexibility.

Contract manufacturing

Hickson Fine Chemicals offer their client two types of service:

1. Toll manufacturing, where developed products are produced under a secrecy agreement.

2. Custom manufacturing, where the product is at an earlier stage of development and they work with the client in scaleup and production.

Hickson's background

The company's pilot plant has 15 stainless steel and glass lined reactors ranging from 10 to 200 gallons with a range of filters, scrubbers and condenser systems. There is also a semi-commercial production unit with five 500 gallon reactors. This operates 7 days a week with graduate chemist cover. Early tonnages of product are made under very tight supervision for data-gathering so that optimal process requirements are quickly developed.

Hickson can handle phosgene, thionyl chloride, chloroformates, ethane thiol, dimethyl sulphate, bromine, chlorine, hydrogen cyanide, anhydrous HCl, sodium metal, nitric acid and oleum.

They also have experience using a wide range of solvents: methylene chloride, dimethyl formamide, dimethyl sulphoxide and dimethyl acetamide as well as the common alcohols and aromatics.

The fine chemicals and speciality chemicals market in India is fast expanding and these have a valuable role to play in offering value added products to the export market. The emergence of contract facilities with high standards of confidentiality and manufacturing will make a significant contribution to the earning of foreign exchange for the nation from this source.

— T.P.S. RAJAN

CHEMARENA

S.L. VENKITESWARAN

Industrial use of alcohol in Maharashtra

We had commented in these columns about the cut in supplies of alcohol to major industrial consumers in Maharashtra. Not only were the consumers affected but also the alcohol producers who had their storage full and some sugar factrories where molasses storage was full. Some interim relief was given and after several weeks of deliberations the 10% cut in allotment has been restored to past consumers. It is also reported that the new units established on the basis of alcohol assurances given by the Government will be provided 50% of their annual needs in the present sugar year 1991-92 and presumably the full quota for next year. This would we hope be applicable to expansions and new plans yet to start — three new acetic acid plants completed, one new unit and one expansion to start up in 2 to 3 months in all requiring about 40 million litres a year.

The recent difficulties arose because of undue preference to the SM Dyechem project requiring 100 million litres a year but likely to start only early next year by which time fresh production would have commenced. In view of the very large quantity for this project there was probably an inclination by Government to build surplus stocks in advance and they have now decided to allot 10 million litres this year itself even if plant will start only after six months. The party seems to have completed storage tanks in advance.

The "State Excise Basic Statistics" shows the alcohol production and usage in 1989-90 as under:

	(million litres)
Production	243.6
Use for potable (country)	45.6
Use for IMFL	31.2
Industrial use, bulk consumers, defence	121.6
Use for M&TP/ODS*	9.0
Exports -- Other states	14.6
Exports -- Overseas	12.8
Total	234.6

The data for 1991-92 reported is of 280 million litres production of which 170 million litres was used for industry and 110 for potable and other uses. The commitment for projects with alcohol assurance is about 140 million litres in addition to the usage of 121 million litres of 1989-90, say a total of 261 million litres; much higher than the allocation of 170 million litres this year. The stoppage of exports to other states and overseas can help to some extent. The increase in production of sugar/molasses/alcohol from new units may take time to fructify. The situation for the next year is not very assuring and the Maharashtra Government has to ensure adequate and equitable level of supplies to the industrial users who have invested heavily.

There is a report that Government is aggreeable for SM Dyechem to finance technical improvements in a few selected distilleries and take over the increased production realised. It has been pointed out that this is a totally misleading concept based on unreliable assumptions on sugar content of molasses and the level of efficiency in recovery at existing plants. The actual position is that the technology changes (leaving the cost aside) may result in a rise of 20 to 25 litres per tonne of molasses used. Taking an average of 22 litres it could be 10% above current proeuction. Taking the estimate of 270 million litres of this year, this means 27 million litres addition. Certainly SM Dyechem attempting to finance technical improvements in all the distilleries will benefit by only the additional 27 million litres. If they choose to do so only in a few selected and nearby distillieries the benefit will be less than a fourth of this, say 7 million litres. Maharashtra Government must work out a better way to ensure adequate supplies of alcohol to industrial units — say by a scheme of integration of alcohol producing units to specific conversion units. The system of alcohol production and allotment has to be streamlined and rationalised.

Until recently, there was a gap between available quantity for major industrial use and the capacity to convert to chemicals within the state. Exports to users or potable needs in neighbouring states and overseas helped to absorb the surplus. Now it is quite clear that supplies available for industrial use and capacity/demand for such use are nearly matched. There is need to ensure that the major users are supplied from the sources nearest to them to the extent feasible. In the

* Medicinal and Toilet Preparations and Ordinary Denatured Spirit

earlier years a large consumer was obliged to draw supplies from the more distant distilleries to ensure equitable offtake for all producers. This is no longer the case though some users have no option but to draw supplies from more distant places due to their location: for example, Oswal Petrochemicals, Indian Organic Chemicals and the new plants in the Mahad and beyond. There are now several producers integrated with molasses and even sugar production — Sangli, Sanjivani, Kolhapur, Polychem and at an advantage as compared to units located at distances from the nearest alcohol producer. The integrated producers must be allowed to use their own alcohol and a scheme of linking non-integrated producers to supplies from the nearest possible source of surplus that is feasible. It is true that the long list of ass rances over the years on which no specific action ha been taken must be treated as cancelled. Any furth approval of programmes requiring substantial quanti of alcohol say above 3 lakh litres has to be based o a careful assessment of availability. The problem meeting the commitments to SM Dyechem from 199 is going to be extremely difficult unless there is increas in sugar and molasses production. There is a substan tial amount of alcohol as extra-neutral spirit going ou side Maharashtra for fine liquors and there is urger need to severely curtail such outgo so as to ensur maximum availability for industrial consumers in th state.

Butanediol

The plant for Butanediol based on Davy Powergas technology is said to have started in South Korea. This is based on maleic anhydride by esterification and dehydrogenation. A solid resin (acidic) catalyst of Rohm and Haas is said to be used and continuous esterification in a 8 to 10 stage counter current reactor with high yields of over 99% of diethyl maleate. The ester is hydrogenated to give the butanediol. The esterification process is applicable to C_7 to C_{20} acids with C_1 to C alcohols. The Korean plant is to make 20,000 tonnes of BDO and 10,000 tonnes of THF based on 30,000 tonnes of maleic anhydride (based on butane). A second plant on this process is likely in Japan. Meanwhile Du Pont is also going ahead with a THF plant in Spain linked to maleic anhydride from butane. This may also make butanediol.

Cyclohexanol dehydrogenation

Cyclohexanol dehydrogenation to cyclohexanone is the base for caprolactam production. The starting material is phenol for hydrogenation to cyclohexanol or benzene to cyclohexane and oxidation of it by air to a mixture of the cyclohexanol and cyclohexanone. A new process for dehydrogenation of CXL to CXO is reported from Taiwan using copper/zinc oxide catalyst with better yields (*Hydrocarbon Processing*, March, 1992). The usual method is gas phase reaction at 400 to 450°C using Cu/MgO catalyst but the new catalyst of China Petroleum Development Corporation uses modified Cu/ZnO in the liquid phase at lower temperatures.

The catalyst production has been licensed to Nissan Girdler Co. and termed GC-250. Mole ratio of CuO to ZnO varies from 2 to 1 to 3 to 1. The catalyst is reduced by hydrogen to start with at 140°C to 160°C and has a promoter to inhibit dehydration and coking. The reaction is endothermic and "cold spots" may develop. The GC-250 catalyst has longer life and tolerance of more water. Life time of catalyst is claimed to be 24 to 30 months. Temperatures were 240°C to start with and gradually increased as reactivity was reduced. It is claimed that less by-products are produced.

There may not be much relevance of this catalyst for production starting from cyclohexane itself but it could be useful when phenol is the starting point. India's production is based on the conventional cyclohexane oxidation.

Fumaric and tartaric acids made in India

Thirumalai Chemicals, a major producer of phthalic anhydride in the country has diversified to the production of maleic anhydride and of tartaric acid with its derived salts. Fumaric acid is also recovered as a byproduct of maleic anhydride production and has a limited market as a food acid besides its ferrous salt for pharmaceutical use. The production of tartaric acid is probably a landmark in India, being for the first time and by a synthetic route (as attempts to recover tartaric acid from natural sources such as tamarind have proved to be uneconomical and the residues of "cream of tartar" from wine production is too little). One of the elegant ways to tartaric acid is by oxidation of maleic acid by hydrogen peroxide and perhaps this is employed by Thirumalai Chemicals. Anyhow, the firm needs to be complimented for its pioneering efforts in this area.

FRANKLY SPEAKING: by Dr. O.P. KHARBANDA

Lessons — An Autobiography

This title (DR AN WANG with Eugene Linden, 248 p, Addison-Wesley Publishing, 1986, $9.95) is a fascinating autobiography of one of the most successful entrepreneurs of our times, a Chinese who made it good in that land of 'milk and honey' — the USA. And the success never 'went to his head', thanks to his Eastern roots, also he never forgot his teachers, family and friends. And much of his personal wealth he continues to donate to good causes in and around the area he grew up. The frontispeace, carries a message which Wang must have taken to heart.

> The master said: To learn and at due times to repeat what one has learned, is that not, after all, a pleasure?
>
> — opening of the Lun Yu, one of the greatest of Confucian classics.

Unlike most autobiographics, these pages are not a catalog of Wang's achievements but rather as a case study of one man making decisions and taking risks. And at the end of it all, Wang observes that although the landscape has changed since the time he 'struck it rich', the opportunities remain for those who choose to seize them. An indication of his success can be gauged by the fact that his 'baby' Wang Laboratories grew in 35 years from a one-man shop to a $3b multinational employing over 30,000, with an average compouded growth rate of 42%. This is the type of growth Wang could just about cope with year after year. Naturally, there were many a roadblock on the way but he tackled them with his typical oriental touch and came out victorious. Attitudes and values that Wang acquired in China long before he came to US had a great bearing.

One of the most important of these was simplicity. Wang discovered, for example, that even in his own seemingly complex specialty of electronics, the simplest solution was usually found to be best solution. Some of the other ingredients of Wang's success: communication, moderation and patience, adaptability, decisiveness, confidence, unconventional thinking, social responsibility and last, but by no means least, luc Wang discovered that with some common sense a discipline, he could compete and succeed in what w an alien society without leaving his values behind.

Wang also discovered there was really no magic mastering the challenges. This great down-to-earth ma maintains that success is more a function of consiste common sense than of genius... Progress does n follow a straight line, future is revolutionary ... it ove turns the conventional wisdom of the present.... whi the computer revolution has produced as enormou industry, few of its commercial pioneers shared in th success... key to long term survival is adaptability an he is quick to add: luck.

Wang had the distinction of being awarded the Meda of Liberty during ceremony of the relighting of the Statu of Liberty. Joining him there were 11 other Americans born abroad, but making their mark in America. Wan considers it a mark of America's generosity that it shoul choose to honor its newest rather than its oldest citi zens. He concludes.

> While American society is by no means perfect, in its opportunities it is almost unique on this planet, and thus the key element in my accomplishments, and also, I believe, something to be cherished.

The Epilogue is quite touching. For many people, their schooling or their work stands in contrast to their outside lives — a price you pay in order to get to do the things you really want to do. Wang does not recognize that distinction. According to him, his education, his research at the Harvard Computation Laboratories, have all been enormous fun. His days are spent doing the things he really want to do.

The satisfaction of turning an idea into something real nevel diminishes, and the great gift of change it that it continually replenishes the stock of new ideas that might be brought to life. The thrill of this challenge more than compensates for the setbacks that are the price of learning and growth. But he adds that there are still many lessons to be learned! The learning never stops, or should never stop!!!.

Dr. Kharbanda, is a visiting professor and an author of repute. His recent title: COMPANY CULTURE: IT'S ROLE IN AN INDUSTRIAL SOCIETY (IMDS 1991). Available from Vivek Enterprises, 5 S.K. Barodawalla Marg, Bombay - 400 026.

Vam planning 3000 tpa diketene plant

Vam Organic Chemicals is undertaking a major diversification programme to integrate its existing plants and make a foray into new areas such as construction chemicals, petro chemicals, electronics and oil drilling. In the company's plan is the further integration of its acetic acid complex through the setting up of a diketene plant with a capacity of 3000 tonnes per annum.

The plant, to be set up at Gajraula in technical collaboration with an American company will also produce other ester derivatives which will take up the total capacity to 7000 tpa. According to company sources, the Rs. 30 crores diketene plant would be the largest of its kind in the country. Currently, much of the domestic demand is met through imports.

Diketene and its derivatives are inputs in the manufacture of dyes, pesticides and pharmaceuticals. In technical collaboration with Teutoberg of Germany, Vam Organic is planning to set up the country's first speciality construction chemicals project. The plant is slated to commence commercial production of about 200 different construction chemicals by next year, say company sources. On a low initial investment of Rs. 5 crores, the company expects to gross a turnover of Rs. 40 crores within four years.

Construction chemicals are polymer compounds which unlike cement are extremely flexible. These compounds, widely in use abroad as building materials, prevent cracks in buildings caused by expansion, dampness or vibrations. According to sources, the company has already initiated the development of the virgin market for construction chemicals.

Vam Organics which is also in the production of adhesives will now begin manufacture of 'super glue' — an expensive synthetic adhesive used in the electronic and watch industries. Super glue is currently imported. Meanwhile Vam Petroproducts is going ahead with its polybutene project despite delays which have pushed the cost to Rs. 180 crores from Rs. 100 crores. The project will use feedstock from the Mathura Refinery to produce polybutene, methyl ethyl ketone and malic anhydride.

Vam Organic is also planning a joint venture in a new area — oil drilling. The joint venture is being worked out with Sonat Offshore of US. The company will be expanding the capacity of its pyridine plant from 500 tpa to 4000 tpa.

Vam Organic, with a turnover of Rs. 120 crores, has currently 12 plants which are wholly integrated with each other to produce alcohol, acetaldehyde, acetic acid, acetic anhydride, vinyl acetate monomers, polyvinyl acetate, emulsion polymers and polyvinyl alcohol.

ADARSH CHEMICALS SETTING UP MALIC ANHYDRIDE PLANT

The low profile Adarsh Chemicals and Fertilisers Ltd. is on the fast track now. The company is setting up a malic anhydride plant at Surat with a total annual capacity of 3000 tonnes at a cost of Rs. 18.66 crores. Croda Colloids of the U.K. is closing down and Adarsh Chemicals will be relocating the plant at Surat. The Adarsh plant is expected to be commissioned at its sprawling 48 acres complex already housing the single super phosphate and sulphuric acid plants at Surat in June, 1993.

The product malic acid is widely used in the food and pharmaceutical industry. India presently imports about 750 tonnes of malic acid every year. Keeping the ever increasing indigenous demand in view and the agreement entered into with Croda Colloids Ltd., marketing will pose no problem. As per the agreement, 2000 tonnes of the total 3000 tonnes production will be exported to Britain. Malic acid, a speciality chemical is a food additive, works as a preservative and adds stabilising eff[...] Pioma Industries, manufacturers [...] Rasna and Parle Products, manufact[...]ers of Citra drink among others will [...] the two companies where the chemi[...] will be supplied.

Rs. 2,000-CR. DIVERSIFICATIO[N] PLAN BY GUJARAT AMBUJA

The Gujarat Ambuja group of com[...]panies is planning to invest ab[out] Rs. 2,000 crores in a diversificatio[n]-cum-expansion programme during t[he] next five years, according to **Mr. Vij[ay] Kumar Gupta**, chairman of the grou[p]. The group plans to put up an integrat[ed] steel plant, at the cost of Rs. 550 cror[es] in Bharuch, Gujarat. It plans to set u[p] a soda ash/caustic soda plant too in Bharuch, at a cost of Rs. 400 crores. Th[e] group will be coming out with publ[ic] issues to part-finance these projects, sa[id] Mr. Gupta.

The steel plant will use Chinese technology to manufacture HR coils. Th[e] project will be set up by Ambuja Foo[ds] Ltd., whose name will be changed t[o] Gujarat Ambuja Steel Ltd. Subsequently, the company plans to set up [a] pig iron plant also, said Mr. Gupta. [A] new company called Gujarat Ambuj[a] Chemicals Ltd. will be floated to set u[p] the caustic soda/soda ash plant. Th[e] caustic soda and the integrated stee[l] plant will be set up in the same complex. The steel plant will have a captiv[e] power unit which will generate 18 MW of which it needs only 12 MW.

The remaining 6 MW will be utilise[d] by the caustic soda plant. The steel slag, a by-product of the steel unit, will be used by the other plant to manufacture cement. Another group company, Gujarat Ambuja Proteins Ltd., is entering the market on July 7 with a public/right[s] issue of 14 per cent fully convertible debentures of Rs. 250 each. The issue, aggregating Rs. 40 crores, is to part-finance the company's expansion programme. The company plans to manufacture maize products like liquid glucose, sorbitol and dextrose.

Speciality chemicals, intermediates project planned in Maharashtra

Vamotiwala Chemical Industries Ltd., is a new project being promoted by **Shri. Shanker G. Bhanushali,** who has been associated with chemical industries for more than two decades. There are three other promoters namely **Mr. C.K. Pandya, Mr. Suresh Nanda,** and **Mr. Suryakant Palav,** who are veteran and experienced technocrats with the experience of several years behind them. The group enjoys good reputation for their fair trading practises and has made remarkable progress in manufacturing and marketing of chemical products. The group's current annulised turnover is Rs. 13.35 crore, and the gross profit is Rs. 52.34 lakhs. The group has a net worth of Rs. 50.36 lakhs. The unit to be located at MIDC, Mahad, Dist. Raigad, Maharashtra (a "C" category backward area), is planned to produce glycol ethers 400 mt p.a., ethylene oxide condensates (emulsifier) 600 mt p.a., vinyl sulphone 600 mt. p.a. and ethyl acetate 3000 mt p.a. The company plans to produce the above products in three plants.

Uses

Glycol ethers: They are used for making paints, varnish, brake fluids, inks, aromatic chemicals.

Ethylene oxide condensates (emulsifiers): These products are used in the manufacturing of pesticides, leather, chemicals, detergents, refineries, process house etc.

Vinyl sulphone: Vinyl sulphone is a dye-intermediate used for manufacturing reactive dyes. It is used by almost every dyes manufacturer like M/s. Colour Chem Limited, Jaysynth Dyechem Ltd., Atul Products Ltd., Atic Industries Ltd., etc. Further it has excellent scope for export to South East Asian & European countries.

Ethyl acetate: It is used as a solvent in the manufacture of varnish, paints, pharmaceuticals, aromatics etc.

Marketing and selling arrangement

As the group is in trading business of chemicals since last two decades, no problems are envisaged in marketing. The products currently being traded include caustic soda lye, soda ash, hydrochloric acid, sulphuric acid, aniline oil, acetone, acetoanilide, phenol, E.O. emulsifier, glycol ether, vinyl sulphone etc. The new venture thus represents a kind of forward integration to the company.

Status of project

At present the company has completed the project of glycol ethers and emulsifers with a capacity of 1000 mt. per annum and started the trial runs. Commercial production is expected by the middle of June 1992. Civil work for the vinyl sulphone project is almost completed and machinery supplies will be finished very soon. The company may start the production of vinyl sulphone by the end of 1992.

Technology arrangement

Glycol ether & E.O. condensate emulsifier: The company has made arrangement for knowhow with M/s Neelgunga Consultants. The latter have set up many E.O. condensate plants.

Vinyl Sulphone: The company has appointed **Mr. S.S. Palav** as a Technical Director of the company, who has experience of about 16 years in the field of dyes and dye intermediates. He has worked with M/s Gujarat Dyestuff Industries, Baroda as a Production Manager for a period of 4 years.

Ethyl acetate: The company is negotiating with M/s Sub-Consultancy Services, which has set up three plants in India.

In order to meet the total project cost (Rs. 580 lakhs) the company proposes to seek term loans worth Rs. 110 lakhs. With the promoters contributing Rs. 180 lakhs and Rs. 20 lakhs coming as state capital subsidy, the company is planning to raise Rs. 270 lakhs from the public.

Chinese delegation moots tie-up in chemicals

The All India Manufacturers' Organisation (AIMO) will sign a memorandum of understanding (MoU) with China New Chemical Materials Corporation (NCM) soon, for promotion of trade, investment and joint ventures between the two organisations.

This was announced jointly at a meeting organised by AIMO at Bombay by **Mr. Huang Chenghua,** vice president, NCM and **Mr.Vijay Kalantri,** president, AIMO. Mr. Huang Chenghua said his organisation was keen on cooperation with Indian Chemical companies in the areas of commodities exchange, transfer of technology, and joint ventures.

This is for the first time a Chinese delegation visited India to promote chemical trade between the two countries. The delegation arrived in India between June 18 and June 29. It visited different chemical plants in Maharashtra including NOCIL and National Chemical Laboratory (NCL) in Pune. On June 23, it met representatives of various Indian chemical companies at AIMO's office in Bombay. The delegation also visited Bangalore, Delhi and Calcutta.

The NCM is a scientific research enterprise under the Ministry of Chemical Industry (MCI) of the People's Republic of China. It has four research institutes and three factories, and is engaged in the development, production and marketing of new chemical materials, technology and special equipment.

Mr. Huang Chenghua was of the view that India and China could join hands and compete with western companies in the global market. Earlier, a member had pointed out that in the previous year, an Indian Government delegation had visited China and it had mooted the idea of forming an Indo-China cartel for competing in the global market. Mr. Chenghua said China is looking for trade cooperation in the following products: organic silicon, organic fluorine, electronic chemicals, engineering plastic, alloys and special chemicals.

Mr. Vijay Kalantri said in the last 12 years, China managed to attract $23 billion foreign investment, and had launched policies to attract a further $25 billion investment in the next five years. Liming Research Institute of Chemical Industry (LRICI) under MCI, China had developed hydrogen peroxide production technology by using anthraquinone process, and it has been adopted by more than 40 factories in China. This technology has already been transferred by China to Indonesia. Hydrogen peroxide is used in different industries like paper, chemical, electrical/electronics, agriculture, water treatment, mining, waste treatment.

FAVOURABLE TRADE WITH NETHERLANDS

India's trade with the Netherlands has shown a surplus of $46.30 million during April-December 1990-91 although the two-way trade is likely to be below $805 millions recorded in 1990-91. The fifth Indo-Netherlands Joint Business Council (JBC) meeting to be held at the Hague on June 25 will take stock of the two-way trade and evolve strategies for augmenting the trade and also investment between the two countries. A high powered delegation led by **Mr. S.M. Datta,** Chairman, Indian section, Indo-Netherlands JBC has left for the Netherlands.

A background paper had identified molasses, rubber, soya oil cake, groundnut cake, sunflower, spices and tobacco as the potential items of exports to the Dutch market. India could import from the Dutch market items like organic chemicals, plastic materials, artificial resin, non-ferrous metal, transpo equipment, professional instrumen optical goods, project goods and t like.

Regarding the Netherlands inves ment in India, the JBC paper points o that it has been averaged durir 1987-90 at a mere $1.3 million. Th major areas of Indo-Netherlands colla boration include polyester, cotton yarn effluent treatment process, tissue cultur plant, agro processing and oil fiel chemicals.

The thrust areas for further collabo ration and joint ventures include agro processing, pollution control, alternative source of energy, horticulture, floricul ture, bio-technology, computer soft ware, chemicals and the like, the paper added.

BORAX MORARJI MAINTAINS DIVIDEND

The directors of Borax Morarji have maintained the dividend at 25 per cent for the year ended March 1992, absorbing Rs. 60.26 lakhs against Rs. 50.71 lakhs including pro-rata dividend on rights shares issued during the year. The turnover at Rs. 2,818.58 lakhs represents an increase of 12.16 per cent over the previous year's performance at Rs. 2,512.90 lakhs. The gross profit of the year comes to Rs. 186.27 lakhs against Rs. 121.48 lakhs while profit after depreciation amounted to Rs. 127.53 lakhs against Rs. 105.12 lakhs. This year provision for taxation works out to Rs. 58.50 lakhs whereas in view of the higher amount of depreciation under the Income Tax Act, no income tax provision was required in the previous year. Profit for the year, after making provision for income tax, works out to Rs. 69.03 lakhs. After adjusting excess provision of income tax relating to previous years amounting to Rs. 5.61 lakhs and bringing back Rs. 29.20 lakhs from profit and loss account, the total amount available for appropriation comes to Rs. 103.84 lakhs against Rs. 129.91 lakhs.

Distillery industry, Govt. lock horns over R & D funding

The distillery industry has refused to fund research into environmental impact of the discharge of distillery effluents on cultivable land as recommended by the Government according to a report in *The Financial Express*.

This has brought to the forefront the issue of whether it is the responsibility of the Government or of the industry to fund R & D in environmental technologies. The distilleries have urged the Government to allow them to use the effluents without further treatment for ferti-irrigation purposes. Secondary treatment of effluents would be too expensive for industry to bear, according to the distilleries.

Environment officials have contended that the cost of a technology cannot be used as the basis for relaxing pollution standards. It was for the industry to look for alternative technologies and the Government could only provide certain inventives for the use of such technologies, say officials.

With this, there seems to be no solution in sight for the nearly two decade old deadlock between the Government and industry on the standards set for distillery effluents and emissions. According to the distillery industry, the standards set by the Government were too stringent and would require high technological costs to implement.

Currently, the distillery effluents after primary anaerobic treatment have a BOD — bio-chemical oxygen demand-level of 5000 which is much higher than the standard level set under the Environment Protection Act. Distillery effluents contain potash and other organic material and can be used as liquid fertiliser for various crops, particularly sugarcane.

However, the Government and industry have not been able to agree on the possible long term impact of the use of such fertilisers on the soil and groundwater. The distilleries have been claiming that the effluents with BOD levels of 5000 can be safely used as fertiliser in sugarcane and paddy fields. They have pointed out that in Brazil, sugarcane yields were higher with the use of BOD level of 30,000.

The untreated distillery effluents in India have a BOD level of 50,000. After primary treatment, the BOD can be brought down to 5000. Further treatment would involve a highly expensive power intensive method and it will prove unnecessary as the effluent could be safely used even at a BOD of 5000, according to the industry. Distilleries have pointed out that there has been research studies in other parts of the world which have concluded that effluents, after primary treatment, can be used to increase crop yield. As a precaution, borewells in the area should be deepened and ground water monitored regularly.

A committee set up in December 1991, had reported that the industry's demand for an upward revision in the standards was not supported by adequate scientific evidence. The industry had been given time to introduce pollution control measures but had not been able to meet the standards set by the Government. The committee also pointed out that since there was no supporting data for using waste with high BOD loads on land in different agro-climatic zones, the industry should be asked to conduct techno-economic feasibility studies of using primary treated water for irrigation purposes. These studies could be conducted under various agricultural universities. It was suggested that as an interim measure, the distillery units should be permitted to dilute the primary treated effluent for discharge on land exclusively for sugarcane cultivation.

INDIAN RAYON TO DOUBL[E] CARBON BLACK CAPACIT[Y]

Indian Rayon and Industries Lt[d] have decided to double their capa[ci]ty of carbon black from 2,000 TP[A] to 4,000 TPA. Effective steps [to] implements the expansion hav[e] already started and orders for majo[r] equipment will be finalised in th[e] next few months.

The company expects to complet[e] the expansion by September 199[3] and to be in a position to cater t[o] additional demands of the industry from October, 1993.

MOLASSES CRISIS PEAKS AGAIN IN TAMIL NADU

Despite the Union Governme[nt] acceding to the Tamil Nadu sugar indu[s]try's demand for exporting molasses [to] cope with rising stock and clearin[g] about 30,000 tonnes, it has lent no relie[f] to the industry. The molasses crisi[s] which has become an annual feature i[n] the South, has peaked yet again. Th[e] industry was disappointed when th[e] Tamil Nadu Government's request i[n] April to the Centre to export one lak[h] tonnes of molasses stock was not fully granted. Now, things have again come to a head with the State's molasses production in 1991-92 pilling up to 6.08 lakh tonnes on an opening stock of 2.53 lakh tonnes.

According to the estimates of the South Indian Sugar Mills Association, (SISMA), in the existing pattern of distribution, after consumption by the various distilleries, export and other uses, the industry would still be left with 3.20 lakh tonnes at the end of the season. The Association has approached the Tamil Nadu Government to take up the case of the remaining 70,000 tonnes of molasses. Parallel efforts by the famous sugar lobby at the Centre is also being made, with direct representations to the Ministry of Chemicals and Fertilisers.

Maharashtra to increase alcohol price

The Maharashtra government has decided in principle to increase the price of industrial alcohol from Rs. 3.75 to Rs. 4.50 per litre to distilleries in the state. It is also likely to raise the "transport fee" from 20 to 30 paise a litre, it is reliably learnt. Distilleries have been clamouring for a price increase to offset power and fuel cost increases, which constitute a lion's share of the cost in distilling alcohol from molasses.

The government has also decided to lift the 10 per cent cut on alcohol allocation to the chemical industry. New units are being allotted with half of their assured quota, a move which threatens to make upcoming alcohol-based companies in the state sick from birth.

Existing units are to get their allotments as on paper, in contrast to the practice of allotting more than the quota because of surplus. For example, Indian Organic Chemicals, which is threatened with closure, has been allotted 203 lakh litres as against its normal offtake of 284 lakh litres. Somaiya Organo-Chemicals, closed since one month, has been allotted 112 lakh litres as against its offtake of 163 lakh litres. While the government had resorted to these cuts fearing a presumed shortage of alcohol, it has taken another decision which goes against this presumption. It proposes to allow sugar mills to export molasses in view of the surplus production. The distilleries are carrying heavy stocks of alcohol. Non-release of alcohol is not only hampering the operation of chemical units but also production in distilleries.

According to industry sources, the 1991-92 season witnessed record production of sugar of 42 lakh tonnes, the highest-ever in Maharashtra. As such, there is no shortage of molasses or alcohol. Alcohol production during the year is estimated in the region of 2800 lakh litres. Even after restoring the 10 per cent cut in allocations, there would be a surplus of 320 lakh litres for allocation to existing units as per their bonafide requirements, according to industry calculations.

BICP TO BE RECAST

The Government is planning the restructuring of the Bureau of Industrial Cost and Pricing (BICP) to a tariff commission where most of the industrial products will be studied. The Government is also considering a further reduction in import duties and a decrease in the number of companies under the licensing list. Stating this at a seminar on "Perspectives for industrial growth" organised by the PHD Chambers of Commerce and Industry (PHDCCI), the Minister of State for Industry, **Prof. P.J. Kurien**, added that it was not possible to carry on giving budgetary support to sick and unviable units.

Ozone depletion theory a scientific fraud?

The ozone hole scare is a global hoax supported by organisations that stand to gain billions of dollars by offering alternatives to so-called ozone-destroying chemicals, two authors have said.

Their 357-page book, released at the Earth summit in Rio this month, describes the ozone-depletion theory as a scientific fraud, driven by money as well as the Malthusian view that the world needs fewer people. Quoting extensively from scientific studies, the new book, *The Holes in the Ozone Scare*, debunks as myth the belief that man-made chlorofluorocarbons (CFCs) are destroying ozone — a key assumption on which the ozone depletion theory hinges.

The proposed remedy of banning CFCs will lead to cutbacks in energy, food preservation and living standards, and millions will die in Asia and Africa, according to the book, published by Washington DC-based 21st Century Science Associates. Drawing upon published scientific papers, authors Rogelio Maduro, a geologist and associated editor of *21st Century Science and Technology* magazine, and Ralf Schauerhammer, Chairman of the Fusion Energy Forum, refute point-by-point almost every aspect of the ozone-depletion theory.

The authors say the Antarctic ozone hole was not discovered by American scientists in the eighties, but by British physicist Gordon Dobson in the mid-fifties long before the widespread use of CFCs. Giant chemical companies will make hundreds of billions of dollars by offering alternative replacement chemicals for CFCs which have vital applications in refrigeration, medicine, fire-fighting, and industrial production.

This chemical cartel has already made six billion dollars on CFC replacement since the 1987 Montreal protocol was signed to phase out the use of CFC chemicals. But money is not the only motive driving the ozone hoax. The authors say 'behind the action to ban CFCs — and to cut back on refrigeration — is the Malthusian ideology that the world needs fewer people.

The CFC ban will mean millions of refrigeration units installed will be scrapped leading to a worldwide collapse of food storage capacity, and a dramatic rise in deaths from starvation and food-borne diseases. Quoting private estimates of international refrigeration experts, the book says the CFC ban will lead to between 20 and 40 million additional deaths per year by the year 2005.

'Every single tenet of the ozone depletion theory is a fraud,' author Rogelio Maduro told a briefing organised for the UN diplomatic community in New York earlier this year. 'It has been proved a fraud by scientific papers'. The book refutes the claim of ozone depletion theorists that chlorine from the CFC molecules destroys ozone. Natural sources of chlorine far exceed chlorine from CFCs thousands of times, the book says quoting studies.

Chlorine is vented into the atmosphere by evaporating sea water and volcanoes. Mount Erebus on Antarctica alone ejects 1,000 tonnes of chlorine a day, annually venting 50 times chlorine than an entire year's CFC equivalent. The book alleges that scientists who tried to reveal findings contrary to the ozone depletion theory have had their papers rejected, their grants discontinued, and some have even lost their research and teaching jobs.

The authors cite several research studies that suggest that CFCs are degraded by microorganisms on the ground and in the soil and a large amount of CFCs are also absorbed by the oceans despite their low water solubility. The book also refutes the widely held assumption that CFCs rise in the air, climb all the way up into the st tosphere and destroy the ozone lay

The chemistry of CFCs in the atm phere has never been observed, authors claim, adding that the ent ozone depletion theory was construct on a computer. The book says, leadi ozone depletion theory proponents in top posts with command over scie tific journals and associations — in position to decide who gets resear grants and which scientific papers a published. Much of the ozone depleti theory is based on the assumption th as the ozone layer disappears, ultrav olet radiation from the sun will increa on earth and with increasing inciden of skin cancer.

The authors say there is no eviden that ultraviolet radiation is increasing it should have if the CFCs were real eating away the ozone layer, the scien tists said again quoting scientific paper Citing a study by an America researcher, Joseph Scotto, from the U National Cancer Institute, published i the US journal *Science*, the book say in some places ultraviolet radiatio might actually be decreasing. Followin publication of the study, Scotto had t stop further research because fundin for the ultraviolet recording stations wa stopped, and he 'no longer receive funding to travel to conferences t present his findings,' the book says. Th Montreal protocol also bans the use o some other chlorine containing chemi cals which are widely used in the elec tronics, and other industries.

THREE MORE FLYASH BRICK UNITS

Three more flyash brick units will be set up at Dadri, Delhi and Ahmedabad under the Indo-Dutch bilateral co-operation programme. The decision was taken at a meeting convened at New Delhi on June 20 by the Power Ministry. HUDCO which is co-ordinating this scheme, will receive financial assistance from the Netherlands to help establish these brick plants.

Ozone friendly AC systems to be introduced

Blue Star Ltd. will introduce India's first ozone-friendly air conditioning system. The technology, which eliminates the use of chlorofluorocarbons (CFCs), will contribute considerably less to ozone layer depletion and the green house effect than the existing systems.

The announcement from the leaders in central air conditioning came as the first practical measure from the corporate sector towards reducing environmental abuse, a press release said.

Most air conditioning systems, using centrifugal chillers in the country, use the refrigerant R11 which is not ozone-friendly. The new imported york package chillers of Blue Star use a hydrochlorofluorocarbons (HCFC) refrigerant, called R123. The ozone depletion potential for R123 is less than 2 per cent of that R11. The Blue Star R11 open type centrifugal chillers, that are already in the market, can conveniently switch over to the R123 type. Companies like Du Pont and Hoechst have developed plants to make R123, which will become available to India.

Blue Star had already received an order from the American consulate, Madras, for the air conditioning of its offices, library and other areas, replacing the existing imported centrifugal chillers.

The order value of the imported components exceeded $1,60,000 (over Rs. 48 lakh). Apart from importing the chillers and pump sets, the local job involved dismantling of the existing sets and installing new chillers, pumps sets. A major contribution to ozone problem comes from CFCs because of the high chemical stability of these products.

These persist for long periods of time and as a result, theoretically, the entire amount released can diffuse into the stratosphere and interfere with the ozone oxygen balance.

The long-term persistence in the atmosphere, coupled with the accumulation there, is also responsible for the green house potential of these compounds.

Companies like Hoechst and Du Pont are, therefore concentrating on refrigerant HCFCs as substitutes with considerably shorter persistence in the atmosphere.

The ozone depletion potential of HCFCs was only a fraction of that of the CFCs.

Korean collaboration for silica project

Sunrise Polycon Ltd., engaged in the manufacture and marketing of LDPE water storage tanks of international quality and first to manufacture in India PUF insulated tanks, is setting up a Rs. 21.35-crore unit for manufacture of 13,200 tonnes per annum of spray dried silica at Ramnagar district, Varanasi, U.P., a centrally-notified backward area.

The main raw materials required for the project are silica sand, soda ash and sulphuric acid. Silica sand is available in plenty from Allahabad 120 km. away from the plant location. Other raw materials are available from indigenous sources. The precipitated silica to be manufactured by Sunrise Polycon in technical and financial collaboration with Samyoung Chemical Ind. Co. of South Korea will be marketed under the brandname Sysil, an internationally accepted brand. Samyoung has also agreed to buy back 60 per cent of the total production. The balance 5,280 tonnes would be marketed domestically. The domestic demand for the product is put at 42,000 tonnes per annum.

Besides, the demand for the product is growing at 15 per cent per annum. The only other manufacturer in the country is Insilco Ltd., a unit of Vam Organics, whose production is also under implementation with a capacity of 12,000 tonnes per annum. The Korean company will bring an equity of Rs. 1.71 crores in the new company. The equity issue will be to the tune of Rs. 7 crores. Details of financing the project is being worked out. Meanwhile, civil construction work is at full swing. The phase 1 of the unit manufacturing LDPE storage tanks has commenced production.

The company is promoted by Lunar group which owns Sunrise Polycon and Samyoung Chemical and Ind. Co. of South Korea. The Lunar group has varied interests and these include silic jewellery, plastics, leather goods ar other products with an annual turnov of Rs. 10 crores.

KOTHARI SUGARS SHOWS IMPROVED PERFORMANCE

Kothari Sugars and Chemicals ha maintained the dividend at 20 per cer for the year ended March 31, 1992. Th company crossed Rs. 50 crores mark i turnover topping Rs. 50.85 crores, a against Rs. 33.11 crores in the previ ous year. Profit before interest an depreciation was at Rs. 9.58 crore (Rs. 7.15 crores). After providing fo depreciation of Rs. 2.16 crore (Rs. 2.17 crores) and interest of Rs. 4 crores (Rs. 3.14 crores), the net profi worked out to Rs. 3.42 crores (Rs. 1.8 crores). As there was no tax liability, the surplus available for appropriation was higher at Rs. 4.79 crores (Rs. 4.29 crores).

Appropriations include transfer to general reserve of Rs. 1.40 crores. The proposed dividend will absorb Rs. 87.39 lakhs (Rs. 87.39 lakhs). The improvement in profitability is attributed mainly to the good performances of the sugar factory at Kattur and the polybutenes division. During the 1990-91 season, the sugar factory crushed 4.19 lakh tonnes at an average recovery of 9.63 per cent, one of the highest for sugar units in Tamil Nadu.

In the current season, the factory has already crushed 4.60 lakh tonnes and the season is expected to complete with 5.2 lakh tonnes at an average recovery of 10 per cent. The working of the polybutenes division has improved considerably and the unit is now working at over 100 per cent capacity. The company has completed the implementation of the Karaikal project for manufacturing para nitrochlorobenzene (PNCB)/ortho nitrochlorobenzene (ONCB) at a cost of Rs. 31.18 crores. The products have been well received in the market and tie-ups for export is being finalised.

Plastic colouring units to pay excise

The excise department has defined colouring of plastic granules as a manufacturing activity and as such excisable.

There are approximately 90 colouring units in Bombay which convert on an average one tonne of plastic granules into coloured granules, consumed largely by the smallest processors in the small sector who work on hand-operated injection moulding machines.

These machines cost less than Rs. 10,000 each compared to the plunger and screw type machines which cost several lakh of rupees.

Medium and large units which have these costly machines are not affected by the new definition because colouring and moulding are accomplished in one process.

Justifying the move, the excise circular says that colour granules are clearly distinguishable from colourless granules in respect of physical characteristics, marketability, usage and value.

Colouring units however contested this saying that Bombay University Department of Chemical Technology (UDCT) has certified that there is no change in form, characteristics or physical properties.

Some colouring units in the city have already closed down, according to one convertor who said the new circular will hit the small scale processing sector.

He said small units are unable to get Modvat credit on the 40 per cent excise burden on coloured granules because of non-availability of excise gate passes, one convertor said.

However, manufacturers in the organised sector said gate pass availability was not a problem. The main problem of bringing small units into the excise net is that they have to keep proper accounts, they said.

The additional excise burden on colouring can also be recovered if the manufactured article is excisable, they said.

AIPMA resents move

Meanwhile The All India Plastics Manufacturers Association has strongly resented the move to levy excise duty on plastic coloured granules.

In a press statement issued in Bombay on June 18 the (AIPMA) President, **Mr. Kirit Mehta** has said that the directive completely disregards the fact that the process of colouring and use of coloured granules are undertaken by small and tiny units as they do not have sophisticated screw-type plasticizing injection moulding machines.

"Coloured granules are used mainly by innumerable self-employed entrepreneurs who use hand moulding or plunger type machines due to capital cost considerations. This directive does not affect where the colouring and moulding is done by single process.

But it hits very hard units which have simple and hand operated plunger type moulding machines," Mr. Mehta says. "The entire impact of making colouring subject to Excise is on S.S.I. and tiny sectors only.

There is no alternative for them but to close down their operations," Mr. Mehta says, noting that "in fact many units have already closed down and the remaining ones are in the process of closing down."

"Unless immediate relief is granted through a notification exempting the process of colouring from Central Excise, hundreds of tiny units engaged in colouring and moulding will be thrown out of business." he has concluded.

PVC IMPORTS:

AIPMA resents move on anti-dumping duty

The President of The All India Plastic Manufacturers' Association has strongly objected to the proposed move of the government to levy an anti-dumping duty on imports of polyvinyl chloride. The move has been initiated by the PVC manufacturers who have alleged indiscriminate dumping of materials.

In a press statement issued in Bombay, the AIPMA President **Mr. Kirit Mehta** has said that the high cost of materials has been responsible for the severe recession in the industry.

"We have already drawn the attention of the Government to the fact that the landed cost of the imported polymers including PVC resin is much higher than pre-budget landed cost of the materials. The growth of the industry had been strangulaated during last 2 years because of uncertain foreign exchange position during 1990-91 and devaluation of rupee during 1991-92," Mr. Mehta says.

"We fail to understand the circumstances and the exact reasons for this proposal of levying anti-dumping duty particularly when the custom tariff rates are high, rupee is substantially devalued and indigenous polymer supply remains limited. The cost of the polymers is not likely to come down in the foreseeable future due to indigenous sources jacking up their prices periodically when compared with higher and higher landed cost of imported raw material," Mr. Mehta added.

The present CIF prices of the polymers are the lowest and slight increase in the CIF prices will further make the imports of polymers practically impossible. After the budget announcem for 1992-93 there are hardly any fr bookings of the bulk polymers and supplies from imported sources completely taper off. Under the circu stances AIPMA has strongly dis proved the proposal to increase the d under the guise of anti-dumping duty order to protect some vested intere

MCF ACHIEVES RECORD OUTPUT

The Mangalore Chemicals and F tiliser Ltd. (MCF) has established a p duction record in its ammonia, urea a DAP plants. According to compa sources, the ammonia plant has be running continuously for the last 1 days and produced 50,762 tonnes. T urea plant has been running withou stoppage for the last 155 days and pr duced over 1.45 lakh tonnes. Pr duction at the DAP plant touch an all-time high of 700 tonnes on Ju 14.

IPA laments high excise on paints

The Indian paint industry has been going through a deceleration in the past few years coming to a zero growth rate presently, in the wake of constantly rising excise duty and petroleum prices. Despite an annual loss of about Rs. 4,000 crores being suffered by the country in corrosion, the Centre continues to have a 'step-motherly' attitude towards the paint industry, says **Mr. Harshad Sheth,** President of the Indian Paint Association (IPA).

Speaking to newsmen in connection with the Seventh All India Paint Conference, Mr. Sheth pointed out that the excise duty had gone up steeply from 25 per cent in 1989 to the current level of 40.25 per cent. Similarly, sales tax has been ruling high at 10 to 18 per cent. These impositions are reflections of the Government's conception of paint as a luxury rather than a necessary product, he observed. Ironically, the same Government is the largest consumer of paints.

For example, the biggest consumers are the railways, defence, transport and communication sectors, power projects and nuclear plants, all in the public sector, besides the housing, automobile and consumer durable sectors.

Adding to the excise problem is the escalating petroleum prices. This was particularly so, in the wake of the rupee devaluation which rendered a cost-effective functioning impossible.

Notably, though the Government conceded an overall cut in the maximum import duty for the smaller units, which should have aided the import of many essential raw materials, the concession was offset by the partial convertibility of rupee. Under the circumstances, the industry, which is largely in the small-scale due to inadequate market-size, is unable to sustain itself. In fact, some of the units are facing closure, Mr. Sheth warned. The exemption from excise duty for clearance up to a value of Rs. 20 lakhs fixed two years ago to be-nefit units in this sector has been eroded by the severe inflationary trend.

While pleading for this limit to be raised, the association also wants introduction of a slab system for the duty on this sector. Ideally, the excise duty should be brought down to nearly half of what it is now, to 20 per cent, Mr. Sheth said.

IPA has long been demanding the extension of the Modvat facility to mineral turpentine oil (a basic raw material for the industry), duty waiver on bituminous varnishes, lower import duty on titanium dioxide, among other things. The Government has, however, cold shouldered these requests so far.

Yet another crisis that his seized the paint industry is the dismantling of the Soviet Union. The Indian paint industry has lost its main export market which accounted for nearly 90-95 per cent of its shipment abroad. Currently, export is only negligible. All the above issues are to be dealt with in the forthcoming All India Paint Conference, which is held once in two years, and is scheduled to be convened for the first time in Madras, between January 15 and 17, next year.

PIB CLEARS ICP-HIRA PIPELINE PROJECT

The Rs. 589-crore ICP-Hira pipeline project of the Oil and Natural Gas Commission (ONGC) has been approved by the Public Investment Board (PIB). The project, which is a part of ONGC's gas flaring reduction programme, will on completion, increase transportation of gas from Bombay High to Uran by three million cubic metres per day from the current 13 mcm per day. The Hira platform is already connected to Uran by a gas pipeline and the ICP-Hira pipeline will joint the Hira-Uran pipeline. The laying of pipeline (142-km long and with 3 inches diameter) will be completed b 1995. The project which has a foreig exchange component of Rs. 470 crore out of the total cost of Rs. 589 crores will involve three stages: laying of mai 142-km pipeline from ICP to Hira laying of a lateral pipeline of 11-km (2 inches diameter) from SHP platform t join the main pipeline (the route of th main ICP-Hira pipeline goes very clos to SHP platform) and modifications a the three platforms. The project is await ing clearance from the Cabinet Com mittee on Economic Affairs (CCEA) Meanwhile, ONGC officials hav already started preparing tenders fo awarding contracts for procurement o line pipes.

ENGINEERS INDIA BAGS NUMALIGARH REFINERY PROJECT

A Mega refinery project to be s up at Numaligarh in Assam has bee awarded to Engineers India Ltd., th premier design and engineerin organisation in the field of petroleu and other process industries. EIL wi be prime consultant and will provi complete project services from co cept to commissioning, says an EI release.

The project is being set up by th public sector IBP Co. Ltd., at a co of Rs. 1,830 crores and it is likely t be completed in about five years The Numaligarh refinery will be th 13th refinery in the country an fourth in Assam. Engineers India ha earlier set up the Bongaigaon Refinery and petrochemicals complex a Bongaigaon in Assam and i presently working for the expansion of this refinery as well as the modernisation of the country's oldest refinery at Digboi, the release said.

The Numaligarh refinery is a grassroot refinery which will mee the increasing demand for the middle distilates in the region besides other products.

Leather exports register 25.6 pc growth

Leather exports sector has proved its ability in weathering the vagaries of international markets by registering a growth in export earnings in rupee terms of 25.6 per cent to Rs. 3,210 crore in 1991-92 from Rs. 2,554 crore in 1990-91. Exports in dollar terms have been maintained at $ 1.2 billion, as in the earlier year.

This is creditable, when viewed in the light of the fact that 1991-92 was a year of unprecedented difficulties for exporters, due to combined effects of the worldwide economic recession radical political changes in the erstwhile USSR and severe import compression measures in domestic economy. There are a few noteworthy features in last year's leather exports. One is the further decline in share of finished leather, and fall in export earnings over the earlier year's level inspite of the boosting effects of rupee devaluation.

Given the fact that there is a shortage of raw material for the leather product manufacturers, the increase in the share of value added exports strengthens government's committed policy to encourage only value added exports despite the high decibel clamour of semi finished and finished leather manufacturers, resisting such a policy. Leather garments which were least affected, have not measured upto the expectation of German consumers.

The erstwhile East Germany was a sure market for Indian leather sector, thanks to the rupee payment arrangement. It was expected that the purchasing power of the East Germans would increase and under the (probably fallacious) assumptions of constant tastes and preferences, leather goods exports to the Unified Deutscheland was anticipated to swell on account of this. It remains to be seen if the deceleration in leather garments exports to the traditional market of Germany is a temporary inflexion due to the transitional effects of the unification or something worse. Yet another feature of last year's performance is the larger increase in leather footwear component exports than in footwear itself. This may be indicative of a preference to manufacture footwear by some countries using imported components. It is already known that Italy and France have capacities to manufacture footwear for export. While India can obviously do nothing about discouraging this trend, domestic industry may be tailored to suit international needs. The trend of faster rise in exports of footwear components against footwear has been observed over the past several years.

Notwithstanding the gratifying performance of the leather sector on the export front, it is to be noted that the phase of uncertainty is not quite over yet. These uncertainties stem from both internal and external factors. Externally, the normal vissicitudes of the markets are sharpened by the happenings in the former Soviet Union, eastern and western Europe, as is well known.

Of particular concern are Russia and its neighbouring republics. Until January, 1990, there was only one central buying organisation called LEGPROM for all imports of leather and leather products. Now, purchases are made through three channels — individual companies, individual republics and the central buying organisation. Hitherto it had been easy dealing with the centralised system with one organisation to do business with. Now the changed pattern is likely to erode India's market share, as individual factories or individual republics may prefer buying from other sources. Internally, the problem is of shortage of raw materials and production facilities. Strangely, almost every industry publication or academic paper on the subject speaks of India's "strong raw material shortages. Due to changing priorities in the rearing of animals, the overall growth of cattle stock is likely to be stagnant. Since breeders feel that with lesser number of animals they can have better returns using cr breeds, the average number of holdi is gradually coming down.

The essence of all the governmen policies has been promotion of va added exports and phasing out expo of even finished leathers. The 1992- budget imposed a 10 per cent duty exports of finished leathers to serve a disincentive. This created considera consternation among finished leat exporters and consequently, this du was reduced by five per cent. Surp singly, in the new Exim policy t Commerce Ministry declared that ev raw hides and skins would be allow to be exported subject to licensing. Th made manufacturers of semi finish and finished leathers very happy, b their joy was shortlived, as the gover ment later clarified that "skins an hides covered under the policy are short supply indigenously and the export will not be allowed".

This seemingly funny way of allow ing exports of the low value commo dities in the Exim policy and later dis allowing them by a notification doe have a rationale. The Exim policy ha to satisfy the international demands fo liberalisation, but at the same time gov ernment could not pursue liberalisatio to such an extent as to affect nationa interest. It is not clear whether the gov ernment has abandoned its intention t phase out finished leather exports, o not. However, control by licensing has the imminent advantage of keeping al options open. Supposing for example the new republics like Uzbekistan Ukraine etc. prefer to import finished leather and manufacture products by themselves, India would be a loser if it closes its doors to such markets.

Similarly, the West European countries could also shift preference to finished leather because product manufacturing is hardly a polluting industry as tanning is. A major threat is competition from countries like China, Taiwan, Thailand and Korea.

KSIL plan to set up POY unit

Keswani Synthetic Industries Ltd. (KSIL), engaged in dyeing, twisting and trading of synthetic yarn, is entering the capital market on June 22 with a public issue of 15 lakh equity shares of Rs. 10 each for cash at a premium of Rs. 6 per share aggregating Rs. 240 lakhs.

The company has chalked out an ambitious plan of expansion which includes installation in the first phase of texturising machine and in the second phase setting up of a POY manufacturing plant to make main raw material needed for texturising.

The present public issue is being made to part finance KSIL's Rs. 5.33 crore project at its existing plant at Ankleshwar, Gujarat, to nearly double the dyeing and twisting capacities. The project was already appraised by IFIC. The additional capacities of the plant are expected to become operational for trial production in Oct.-Nov. 1992 and the commercial production will commence thereafter.

KSIL is keen to enter the international markets and negotiations are already on for the export of the company's speciality yarn. The company has been receiving numerous inquiries from potential customers in the overseas markets and for its premium products.

In view of the sound set up, promoters' vast experience and the strategic location of the company's plant close to the main yarn consuming centre, Surat, KSIL does not envisage any problem in marketing its additional production which is already enjoying immense popularity.

KSIL has been promoted by **Mr. Suresh Keswani**, a person with 25 years experience in the textile industry. The company has on its board, **Mr. Y.P. Trivedi, Mr. Vijay Kalantri, Mr. R.K. Gupte, Mr. R.M. Bhat** and **Mr. Mahesh Keswani.**

LOHIA POLYESTER TO EXPAND PFY CAPACITY

Lohia Polyester Ltd., proposes to expand its capacity for manufacturing polyester filament yarn (PFY) and texturised yarn to 1,350 tpa by installing state-of-the-art technological Himson-Teijin Seiki of Japan DT machine along with a Lohia-ICBT (France) draw texturising and other twisting machines. The project, estimated to cost of Rs. 6.80 crore, is expected to commence trial production by September 1992.

According to company director, **Mr. Pawan Lohia,** texturised and polyester filament yarns are widely used in the manufacture of synthetic fabrics. As per the Eighth Five Year Plan, the demand for polyester filament yarn is expected at 2.25 lakh tonnes by 1992-93, 2.53 lakh tonnes by 1993-94 and 2.84 lakh tonnes by 1994-95. The project cost of Rs. 6.80 crore is proposed to be inanced through promoters' equity of Rs. 2 crore, including Rs. 25 lakh from NRIs., public issue of Rs. 3.60 cr. and lease finance of Rs. 75 lakh.

The company plans to enter the capital market with an issue of 36 lakh equity shares of Rs. 10 each for cash at par aggregating Rs. 3.60 cr. The company is using its internal cash accruals of Rs. 20 lakh and state subsidy of Rs. 25 lakh will be available.

BAGRI MINERALS

Bagri Minerals & Chemicals, engaged in processing ultrafine minerals silicate filters, plant to set up a modern unit. The company primarily manufactures fillers, extenders and diluents. These products find wide usage in industries manufacturing rubber, plastics, PVC, polymers, paints, printing inks, detergent soaps and paper.

EIGHTH PLAN END

Refining capacity to go up by 8.7 mt

Union Minister of Petroleum and Natural Gas **Mr. B. Shankaranand** has said that the expansion of the existing refinery facilities in the the Eighth Plan would bring in an additional refining capacity of 8.7 million tonnes.

Speaking at the foundation laying ceremony of the new crude distillation unit being set up by Madras Refineries Ltd. (MRL) at the Cauvery basin in Panangudi, he said the new refineries included Karnal Refinery, Mangalore Refinery and Numaligarh Refinery with capacities of six million tonne, three million tonne and three million tonne respectively.

In addition to this, there were proposals to set up three more new refineries with each having a capacity of six million tonne, he said. These would be located in the eastern, central and western India. With these proposed units and the expansion of the existing refineries, the refining capacity in the country would go up by about 90 million tonnes, he said.

Mr. Shankaranand said in line with the new industrial policy the government had taken a decision to give a letter of intent for a refinery of a nine million tonne capacity under private sector. Emphasising the pressing need for bringing in the private sector to bolster the exploration projects, he said his Ministry had received 24 bids from 31 countries for exploration work in 13 blocks. "It is expected that these offers when finalised will add to the exploration efforts of the country".

Referring to the proposed refinery in Panangudi, the Minister said the facility, while increasing the total refining capacity by 0.5 million tonne per annum, would also result in saving of about Rs. 30 crore in foreign exchange every year.

Mr. Shankaranand said the unit could be expanded at a later stage when ONGC struck more oil and gas in the Cauvery basin. MRL, the premier refining unit in the south which was poised for a massive expansion of its refining capacity, had come forward to set up refining facilities in Panangudi for processing the crude near the producing area itself.

The products thus obtained would be supplied to Nagapattinam Quaid-E-Millet district and the neighbouring districts of Thanjavur, Tiruchirapalli, Pudukottai and South Arcot, he said. MR was also putting up a plant for t recovery of LPG which would result the production of 16,000 tonnes of LP per annum.

Mr. Shankaranand said th Rs. 1,725-crore aromatic project to b set up in the joint sector by MRL an SPIC, would be a great boon to Tam Nadu as it produced 23,000 tonnes c benzene, 30,000 tonnes of ortho xylen and two lakh tonnes of PTA per annum It was estimated that there was scope fo investment in varieties of petrochemi cal industries to the extent of Rs. 2,50 crore. These developments would trans form the industrial scenario in Tami Nadu, he said. Laying the foundation stone for distillation plant of MRL a Panangudi, President **Mr. R. Venkataraman** called for a healthy competition between the private and public sectors to help the Indian economy achieve better productivity and efficiency.

He said the public sector units in the country performed well by and large but more needed to be done to keep pace with its growing requirements. He said India could not afford inefficiency in public sector units which had a monopoly in vital national resources. The important aspect of the new economic policies was to redefine and reassess public sector's role, he said.

Praising Madras Refineries' performance, Mr. Venkataraman said though the country had 12 oil refineries, there was every need to take urgent action to increase refining capacity to meet the projected demand for petroleum products.

Mr. Venkataraman said the demand for petroleum products in the country was expected to go up to 102 million tonne per annum by the year 2001 from the present 60 mt. The available refining capacity was 52 mt per annum and the proposed refinery assumed specific importance in the context. The Madras Refineries unit in Panangudi located near Nagapattinam would have a crude distillation capacity of 0.5 million tonne per annum. The refinery, scheduled to be commissioned by July 1993, is expected to produce 7000 mt of LPG per annum, 1,02,000 mt of naphtha, 1,33,000 mt of superior kerosene, 1,07,000 mt of high speed diesel and 63,000 fuel oil.

Mr. Venkataraman switched over to Tamil while speaking at the function, much to the delight of the audience. The President recalled the steps he had taken first as State Minister, then as Union Minister and now as President, to develop oil exploration projects in Cauvery basin.

He said he had suggested some time back to the Union Minister for Petroleum and Natural Gas that no stone should be left unturned in the exploration and development of oil resources in the country as this formed the backbone of economic development. Referring to the need to promote environmental consciousness, he said it was poor people who could protect the environment by planting trees and not summit conferences like the one held recently at Rio De Janeiro. The Tamil Nadu Governor, **Mr. Bhishma Narain Singh,** said the twin facilities of crude distillation and LPG separation were crucial from the standpoint of industrial development of the Nagapattinam region. The project was yet another feather in the cap of MRL, which had a good record of productivity and profitability and served to dispel the general impression that public sector undertakings were a drain on the economy. Mr. H. Krishnamurthy, MRL Chairman, said MRL was implementing projects totalling an investment of about Rs. 500 crores for completion by 1993-94. The refinery and LPG separation unit at Panangudi cost Rs. 155 crores. The pilot project to run buses using compressed natural gas (CNG) was an important project taken up by MRL for which a compressor station had been established at Nagapattinam. The District Collector, Nagapattiam Quaid-E-Millet District, **Mr. K. Skandan,** offered felicitations. The Director (Technical), MRL, **Mr. R. Sundaresan** proposed a vote of thanks. The crude distillation unit will produce LPG, naphtha, superior kerosene, high speed diesel, and fuel oil.

Solvent extraction technologies highlighted at IIP meet

India has emerged as one of the world leaders in solvent extraction technologies relevant to petroleum and petrochemical industries, and is poised to save foreign exchange worth several hundred crores of rupees with its indigenisation successes in the sector.

Against stiff global competition, the country has emerged only the third in the world to possess an indigenous technology using sulpholane as a solvent to extract benzene and toluene from naphtha, one of the several fractions obtained while distilling petroleum crude.

It also now has the technology to produce food grade hexane — hexane with extremely low benzene content — for use in extracting vegetable oils, and in pharmaceutical, rubber, paints and plastics industries. The two technologies, developed jointly by the Indian Institute of Petroleum (IIP), Dehradun, and Engineers India Limited (EIL), have been commercialised, making India one of the few overseas licensors in this area.

"This is one area where we should greatly accelerate technological development", said **Mr. Lovraj Kumar,** Chairman of the Scientific Advisory Committee of the Ministry of Petroleum and Natural Gas, inaugurating a two-day workshop on solvent extraction technologies, held at IIP in Dehradun recently.

The meet was organised to bring together for the first time the scientists, current users and prospective customers to review the present status of the technologies and scope for improvement. Besides the technology to extract aromatics such as benzene and toluene, and food grade hexane, using sulpholane as a solvent, the IIP now has the know-how to produce the solvent sulpholane, which the country is importing at a huge cost to meet its demand for 170 tonnes per annum. A Gujarat-based firm is slated to begin indigenous sulpholane production within a year.

The IIP is also studying the potential areas where sulpholane could be replaced by a more efficient and safer solvent, n-methyl pyrrolidone, called NMP for short. A further breakthrough is the know-how to produce aviation turbine fuel from the reformed naphtha fractions.

The IIP's solvent extraction technology to produce benzene and toluene is one of the largest technologies developed indigenously, IIP scientists told newspersons. The technology was developed at a time when India had only two operating units and was planning a third based on imported technologies.

The first commercial unit with the indigenous IIP-EIL technology developed in 1985 went on stream at the Bharat Petroleum Corporation Limited (BPCL), Bombay, and the second at the Cochin Refineries Limited (CRL), Cochin, in 1989.

The two units have the capacity to produce 98,000 million tonnes per annum of benzene and 20,000 million tonnes per annum of toluene each and are currently operating at over 100 per cent efficiency.

The foreign exchange savings from the BPCL and CRL units alone in terms of production cost are over Rs. 200 crores every year, IIP scientists estimate. The demand projections for benzene by the year 2000 are 858,000 tonnes per annum against the present capacity of 320,000 tonnes per annum.

Four more units are proposed to be set up at Haldia, Madras, Bombay and Saleempur (Uttar Pradesh) based on the IIP-EIL technology. The technology to produce food grade hexane, also us sulpholane as a solvent, has been co mercialised at BPCL and Mad Refineries Limited (MRL), Madras the past two years.

With the international specificatio for the benzene content of food gra hexane expected to become even mo stringent, the IIP has also conduct studies on using NMP as a solvent place of sulpholane. NMP has prove to be more efficient and environmen friendly and less toxic solvent than su pholane, IIP director **Mr. T.S. Prasad Rao** said.

NMP can be used in place of sulpho lane in the existing units with mino changes, scientists say, adding that th changeover is expected to double th throughput of the units and improve th hexane quality.

The IIP's technology to produce avi ation turbine fuel, developed in colla boration with the Hindustan Petroleum Corporation Limited and the EIL, i expected to replace existing units in th eastern refineries which are using a obsolete liquid sulphur dioxide-base technology.

Fuel-efficient auto engines developed

Scientists at the Indian Institute o Petroleum (IIP) Dehradun, are incorpor ating simple design changes in engines of two-wheelers to save fuel and reduce smoke emissions, says a report from Dehradun.

Laboratory prototype engines developed at IIP have provided 1-12 per cent fuel economy and reduced hydrocarbon emissions by 30-40 per cent.

The main advantage of the new design is its low cost and easy adaptability to Indian conditions, IIP scientists claim. The IIP technology is based on selective exhaust recirculation (SEGR) which recirculates only the hydrocarbon-rich portion of the exhaust gases.

UNREMUNERATIVE PRICES

Pfizer stops production of prednisolone

Pfizer Ltd. has stopped production of one of its drugs — prednisolone —marketed under the brand name 'Deltacortrie', even as chemists and pharmacists report an acute shortage of this drug in the market. Prednisolone is an important glucocorticoid steroid having anti-inflamatory, hormonal and metabolic effects. It is widely used for treating endocrinal disorders (kidney disorders), rheumatic diseases, respiratory, hematological and opthalmic diseases. A vital aspect of steroid treatment is that it needs to be sustained and abrupt withdrawal of the drug can cause complications. It is a price controlled drug with a Government notified price of around Rs. 26,000 per kg. for the bulk drug. According to estimates by the Department of Chemicals and Petrochemicals, the country's actual production, in 1990-91 was 2,246 kg. Against an estimated demand of 4,961 kg. The estimated demand for the bulk drug in 1991-92 was put at 5,209 kg.

Pfizer stopped formulating the drug as the Government fixes formulation prices on the bulk drug price of Rs. 26,000 per kg. "Given the acute shortage prednisolone (Wyeth Laboratories is the only manufacturer of the bulk drug in the organised sector) and given that the landed price of the imported bulk drug is approximately Rs. 60,000 per kg, it was not viable for us to continue producing the drug, according to **Mr. Dilip Shah** of Pfizer quoted in *The Financial Express*.

Mr. Shah pointed out that the imported Chinese material costed around $ 900. At a rupee dollar rate of 31, the cost works out to Rs. 27,900 per kg. The total cost inclusive of a 110 per cent duty works out to Rs. 58,590 per kg. "We were still continuing to import and formulate prednisolone when the rupee-dollar exchange rate was 18. It is no longer possible to continue doing so now, says Mr. Shah,

It may be recalled that the Government had turned down drug industry's pleas to allow import of bulk drugs and intermediates at the official exchange rate. What further compounds the problem is that price revisions for formulations take years to materialise and by then its time for a fresh application again! A spokesman of Wyeth Laboratories also pointed out that the government policy was 'irrational'. The company manufactures prednisolone bulk and formulations. He pointed out that most small scale units were able to get away by charging as much as Rs. 50 for a 5mg (10 x 10) pack as against a notified price of Rs. 35.08 for the same quantity.

DR. REDDY'S GROUP DOES WELL

Dr. Reddy's group of companies has closed the financial year 1991-92 with a spectacular performance all around. The flagship company, Dr. Reddy's Laboratories Limited has achieved a turnover of Rs. 102.88 crore for the year ended March 31, 1992, a growth of over 94 per cent over the earlier year's turnover of Rs. 52.98 crore. Its gross profit after providing for interest stood at Rs. 14.86 crore as compared to Rs. 4.37 crore in the previous year.

After providing for depreciation Rs. 1.73 crore (Rs. 1.21 crore) and taxation Rs. 2.85 crore (Rs. 0.15 crore), it arrived at a net profit of Rs. 10.28 crore as against Rs. 3.01 crore, an increase of 240 per cent. The board of directors of the company has recommended a final dividend of 10 per cent on the post-bonus equity. Earlier, the company has paid an interim dividend of 20 per cent. It had given a one-for-two bonus in December. Cheminor Drugs Ltd., another group company, has closed the year 1991-92 with a turnover of Rs. 33 crore.

Import duties on bulk drugs, intermediates reduced

The Union Government on June 19, reduced central excise and customs duty for motor cars, light commercial vehicles, television sets (both colour and black & white), bulk drugs and drug intermediates. The concession announced by a series of notifications amount to over Rs. 100 crore in a full financial year. But much of this loss is expected to be compensated by higher revenue through higher sales and imports. As regards drugs, the basic and auxiliary customs duty have been reduced from 110 per cent to 80 per cent on specified bulk drugs, from 95 to 70 per cent on intermediates of bulk drugs and from 65 to 40 per cent on homeopathic medicines.

PM Instrumental

A Prime Ministerial note ordering that all efforts should be made to avoid a drug price increase forced the Union Finance Ministry to drop its objections and take a quick decision recently to reduce import duties on bulk drugs and intermediates. In fact, the plea for reduction of import duties on drugs came under sharp attack from the Finance Secretary, **Mr. K.P. Geetakrishnan,** at an inter-ministerial meeting held on June 16 under the aegis of the Cabinet Secretary, **Mr. Naresh Chandra.** Among others who attended the economic core group meeting were chairman of the economic advisory council, **Dr. Bimal Jalan,** planning secretary, **Dr. Nitish Sengupta** and health secretary, **Mr. R.L. Misra.**

Given strong objections from the Finance Secretary, the meeting expressed itself in favour of an exercise by representatives of the Health, Finance and Chemicals & Petrochemicals Ministries on the advisability of bringing down custom duties on drugs. But what swung the decision in favour of a reduction was last-minute lobbying by the Department of Chemicals and Petrochemicals with the Cabinet Secretary recently. **Mr. Naresh Chandra** was told that **Mr. Narasimha Rao** himself had noted on the file that drug prices should not be increased and the issue should be taken up with the Finance Ministry. It is reported that Mr. Chandra overrode objections from the Finance Ministry with the rationale that the Prime Minister's views were on paper. It was argued that an immediate 5 to 15 per cent increase in drug may not be politically appreciated, especially under current inflationary conditions.

Thus, while the announcement of reduction of duties on cars, light commercial vehicles and TVs was inevitable on the eve of Mr. Rao's visit to Japan, the decision to include drugs in the list was taken later. In fact, there was a flurry activity in the Ministry of Chemicals and Petrochemicals only on June 19, when the Finance Ministry called for last-minute details on the customs duty incidence on drugs.

The Chemicals and Petrochemicals Ministry had been lobbying hard for a duty reduction soon after the budget, when the government decided to de-link drug imports from the official Rupee exchange rate. The initial plea was for putting imports back on the official rate, but this was rejectged outright by the Finance Ministry. As a fallback, the Department demanded a 25 per cent reduction in the duty rate to keep drug prices from going up.

Armed with a Prime Ministerial recommendation (the PM being the Minister in-charge), the department missed a golden opportunity to hammer its point across to the Finance Ministry when the Minister of State **Dr. Chinta Mohan,** did not turn up for a scheduled meeting with the Finance Minister, **Dr. Manmohan Singh** last month. Dr. Mohan was reported to have been indisposed, but the department officials had to let go on arguing two important issues with Dr. Singh — the continuing imbro over the demand for reduction in duty rate of paraxylene and the need evolving a mechanism to keep d prices under control.

In the inter-ministerial meeting, Finance Secretary did have a point w he argued that a reduction in cust rates would lead not only to a reve loss of Rs. 50 crore, but also set a fiscal precedent by falling into the t of manipulating duty rates to bala fluctuations in the exchange rate. Bu quote clearly his views did not ma with those of the Prime Minister's.

The meeting, however, was una mous in wanting a new and liberal dr policy announced as quickly as pos ble so that a large number of drugs c be decontrolled, in order to avoid pitfalls of keeping governmental tabs hundreds of finished drugs.

The Finance Ministry had argued th drug price revisions would beco uncessary if prices are decontrolle There was even demand to link t exercise to reduce duties with t announcement of a new drug policy, b this linkage was rejected by the Mini try of Chemicals and Petrochemical

THRUST ON SHELLAC R & D PROJECTS

The shellac export promotion cou cil has given a thrust on research a development projects for production sophisticated goods so as to earn mo foreign exchange for the country.

The Secretary of the counci **Mr. R.N. Banerjee,** said on June 2 that sponsored jointly by the shella trade and the Union governmen research was going on chlorine-fre bleached lac, lac dye, and shellac fo pollution control besides toxicologica study in the Indian Institute of Technol ogy, Delhi and Kharagpur, and in th all-India Institute of Hygiene and Publi Health, Calcutta.

Astra-IDL commences manufacture of prostaglandins

Astra-IDL's Rs. 1.2 crore facility on the outskirts of Bangalore for the synthesis and formulation of prostaglandins used in maternal care went on stream recently. These drugs can substantially reduce the number of women who die every year in India during pregnancy and labour.

Based on a new and efficient method developed at the National Chemical Laboratory (NCL) at Pune, the facility can synthesise two prostaglandins made into three different fomulations to halt bleeding after delivery, induce labour and for abortions. These drugs are so potent that the present licensed capacity of half a kg every year is sufficient to provide 1.5 million doses.

Prostaglandins were not being made in India. In fact, bulk manufacture of these local hormones was the monopoly of the American pharmaceutical company, Upjohn. Manufacture of prostaglandins in India has made it possible to sell the formulations at one-tenth the international price remarked **Professor Sune Bergstrom,** who won the Nobel Prize for his work on prostaglandins. Their manufacture in India can save about nine crores in foreign exchange every year.

Astra-IDL, would be in a position to export these vital drugs to other developing countries, observed Dr. Bergstrom who is an adviser to Astra-IDL the Indian subsidiary of the Swedish drug manufactuer, AB Astra, and also chairman of the Astra Research Centre India at Bangalore. Astra-IDL would be introducing a third prostaglandin in the Indian market next year, said Dr. Bergstrom. Indian women would then have access to more prostaglandins than any other country in the world. Prostaglandins have been known in India for nearly two decades. When global trials were initiated by the World Health Organisation (WHO) at the behest of the Scandinavian countries, almost half the trials carried out in developing nations were in India.

The prostaglandin carboprost will be provided as an injection in a single-use prefilled syringe. It is effective in stopping bleeding after delivery. One out of five maternal deaths in India occur as a result of such bleeding and are avoidable, said **Dr. K. Bhaskara Rao** a consultant for Vijaya Hospital, Madras, at the Astra-IDL press conference. The Tamil Nadu Government has agreed to "test" trained doctors (in district hospitals and one taluk hospital in North Arcot district) to prevent and treat post-delivery bleeding, he added.

Since carboprost acts by contracting the uterine muscles, larger doses of it is useful in inducing abortions. It could be used for abortions even after 14 weeks of pregnancy and was safer than alternative methods which involved introducing chemicals or a catheter into the uterus, noted **Dr. K.S. Raghavan,** general manager of Astra-IDL's maternal health division.

The prostaglandin dinoprostone is available in two formulations, both used for inducing labour. One formulation was as a gel applied directly to the uterine cervix to cause immediate dialation and the other as a tablet. The method followed erstwhile of inducing labour by giving an oxytocin drip forced the patient to remain in bed. With dinoprostone, the patient can move around until labour. Further, the oxytocin method was observed to lead to more post-delivery bleeding, added Dr. Raghavan.

Prostaglandins need refrigeration and have a shelf life of two years. Astra-IDL is attempting to develop formulations which will be stable at room temperature, stated Dr. Raghavan. Astra-IDL also manufactures and exports clofazimine for treating leprosy. It also distributes AB Astra's local anaesthetics, cardiovascular drugs, formulations for respiratory care, and drugs for treatment of gastrointestinal problems in India.

MERCK TO HIKE STAKE IN INDIAN AFFILIATE

The Board of E. Merck (India) proposes, subject to the approval of appropriate authorities, to issue 30.91 lakh equity shares each to E. Merck, Darmstadt, Germany, or their associates to increase their equity stake to 51 per cent from 40 per cent at a premium as may be determined and approved by the appropriate authorities. The shareholders okayed the proposal at the annual general meeting. The company has over 21,000 shareholders.

The company considers this move to be in its best interest as there would be greater commitment and involvement of the parent Germany company in the affairs of the company. The proceeds of the issue will be utilised by the company for its working capital requirements, thus, reducing its dependence on commercial banks.

Addressing the shareholders **Mr. S.N. Talwar,** Chairman said that it was unfortunate for the pharmaceutical industry that the Government is hesitant in formulating concrete policies that would encourage growth. It is disappointing that the drug policy which also should have formed a part of the basic industrial policy announced by the Government in early 1991, is not yet forthcoming. The year 1991 was a difficult one for the company. The high inflation, devaluation of the rupee and adverse exchange rate fluctuations have resulted in steep increases in the cost of inputs. This along with a high interest burden and depreciation arising out of the impressive expansion programme undertaken by the company in Goa have had an adverse impact on its profitability.

Impressive rise in drugs, pharmaceuticals export

Export of drugs and pharmaceuticals has shown commendable growth with the value of exports exceeding Rs. 1,000 crore mark in 1991-92. It is now identified as a thrust area for exports. But very little is being done to identify the factors that have contributed to this performance and their impact on the future exports.

The identification of these factors is important both for evaluating the achievement to date and for sustaining the export growth in the future. The exports grew at an average rate of 32 per cent per year during the five-year period up to 1987-88. This was a period when the drug industry was reeling under the Drug Prices Control Order (DPCO), 1979. The new DPCO came in 1987. The initial period of two years under DPCO, 1987, witnessed a remarkable spurt in the exports, 61 per cent and 83 per cent successively in 1988-89 and 1989-90. Those familiar with the drug industry are well aware that these years saw some relief by way of price increases. In turn, this has an influence on the export price realization. Importers from India who are well aware of domestic prices, matched their prices to induce local manufacturers to export. The period, following these two years, witnessed unprecedented aberrations in the implementation of the DPCO, 1987. This took the toll of growth of exports too with growth rate dropping to just 11 per cent in 1990-91. The restoration of some sanity in the administration of DPCO, 1987, aided by the new trade regime has accelerated the growth rate to 20 per cent in the following year. But this is nowhere close to its potential or even the levels realized during 1988-90 — the period of relative ease of controls and somewhat better domestic prices.

If one were only to look around at the countries of the world which have been successful in the exports market, one comes across a feature which is common to most of them. It is a healthy domestic industry, whether it is steel, automobiles, chemicals or consumer electronics. Even at home, textiles, a top export performer, has a strong domestic presence to sustain its activity. Though the domestic pharmaceutical industry has a strong base, it is being eroded by controls and regulations. In spite of this if the drug industry has excelled on the export front it is because of its versatility and a very strong survival instinct. It would exceed all expectations only if it has the support of the policy framework and is allowed to grow free from controls.

The fact that the drug industry could so readily respond to the changes in pricing is important to note for the planners and policy makers, because future export growth depends to a great extent on this one single factor. As the tightening of controls made domestic market unremunerative, the sheer will to survive forced the drug industry look elsewhere for utilisation of idle plants and machinery.

However, local manufacturers, who have been dependent mainly on brokers in the international market, could not get the ruling market prices in view of the very low controlled prices in the country. Thus, when some price relief was given during 1988-90 it also had corresponding impact on the export price. But since then there has been a considerable slowdown of investment in the drug industry.

The new capacity creation has received a significant set back in the recent years. As the available idle capacity has already been used up for exports, the future growth in exports can come only from the diversion of capacity from the domestic market to the export market.

The devaluation of the rupee on the one hand and the lethargy and un[illegible] delay in the revision of process for domestic market have made exp[illegible] more attractive. With the rupee bec[illegible]ing fully convertible on trade acco[illegible] and fiscal policies promoting exp[illegible] very soon, the drug industry focus w[illegible] be on exports at the cost of the dom[illegible]tic market. Thus, exports in future w[illegible] be at the cost of the Indian consum[illegible] as he would soon discover that many [illegible] the familiar drugs are just not availab[illegible]

It is a fact that in the mid-eighti[illegible] overcapacity and severe competition [illegible] the domestic market had forced ente[illegible]prising young technocrats to look for t[illegible] overseas markets. Thus, what began [illegible] an exercise in survival has ended up [illegible] a lucrative business. These technocra[illegible] will therefore not turn their attentio[illegible] away form the international marke[illegible] unless decontrol of domestic price[illegible] makes further investment attractive f[illegible] them to cater to the domestic marke[illegible] also.

This phenomenon has already set in[illegible] The signals are there for the discerning observer. Inspite of reporting a[illegible] increase in the production of drugs like chloroquin, chlorpropamide, ethambutol, isoniazid, these have become scarce in the domestic market. Secondly[illegible] increasing number of companies are coming up with investment proposals for setting up EOUs and not for the domestic market.

And finally, the share of imports in the domestic consumption is growing at an alarming rate. In just four years from 1986-87 to 1989-90, the dependence on imported bulk drugs has increased from 45 per cent to 67 per cent of the production. Unless these signals are picked up in time and corrective actions initiated to free the drug industry, chances are that the Indian consumer will find it increasingly difficult to get his requirement of quality medicines.

Courtesy: *The Business & Political Observer*

GTBL stuck with unsold rifampicin

Gujarat Themis Biosyn Ltd. (GTBL), the lone indigenous manufacturer of rifampicin — the anti-TB drug from the basic stage, is faced with the prospect of piling stocks, thanks to a lop-sided Government policy.

GTBL, started by a consortium of five private sector drug companies called the Pharmaceutical Business Group (PBG) with a Korean collaboration commenced production of this bulk drug in the beginning of this year. This is the first time that this essential drug is being manufactured in the country from the basic stage, by the fermentation method.

Six months after commencing trial runs, the company is laden with about three months of production (about 11 tonnes) worth Rs. five crores and is finding the going tough. The root cause of the problem lies in the fact that despite having issued licence for the manufacture of this drug indigenously, Government continues to allow duty free import of the two intermediates —Rifa S and 3-formyl rifampicin s v —required for the manufacture of rifampicin. As a result even as GTBL faces mounting stocks, drug manufacturers continue to lift imported material.

Approximately Rs. 100 crore worth of two intermediates are imported every year. Indigenously manufactured rifampicin, as is being done at GTBL, can result in a foreign exchange saving to the tune of Rs. 30 crores every year.

A spokesman of GTBL alleges that leading players in the international market are offering quantities of the two intermediates at throw-away prices. "These companies can get away with such undercutting because they have operations worldwide and a loss here can be made up in some other country. They are fully aware that the market for this drug in India is enormous and hence extremely lucrative", he points out.

It is also being alleged that these companies offer discounts for small quantities purchased. "We are unable to compete with this duty free tariff structure mainly because our input costs viz. electricity etc. are not competitive at all," he says. Major players in the international market include Dow Lepdit (Italy) and a Korean firm.

Landed cost of Rifa S was about Rs. 3,800 per kg four months back. Prices have now dropped to about Rs. 3,300 per kg. say sources.

What rankles these manufacturers more, perhaps, is the fact that in the case of Penicillin G, which is the other drug allowed to be imported duty free, the two indigenous manufacturers viz Indian Drugs and Pharmaceuticals Ltd. (IDPL) and Hindustan Antibiotic Ltd. (HAL) are, well and truly protected.

A 50:50 Penicillin G policy ensures that users necessarily lift half their requirements from these two public sector units. In this case, such is the situation that manufacturers are forced to wait for delivery as the two units are not in a position to match the demand.

PFIMEX TO SET UP GENERIC FORMULATION PLANT

Pfimex International Limited, the Hyderabad based pharmaceutical company is to set up a Rs. 2.95 crore generic and branded formulation production facility at Sarigam in Gujarat. The plant due to go on stream in September 1992 will cater to the export market in Europe, SE Asia and Africa. The existing manufacturing facility of the company in Jeedimetlu, Hyderabad is also due to be expanded at a cost of Rs. 2.5 crores. The company will come out with a rights issue of fully convertible debentures of Rs. 150 each aggregating Rs. 5,25,000. The debentures are to be secured with an interest covering of 14 per cent. Of this, 3,33,334 debentures will be offered on rights basis to the existing shareholders while the balance of 16,666 debentures will be offered to the employees (including Indian working directors).

MP GOVERNMENT HONOUR FOR DR. R.A. MASHELKAR

Dr. R. A. Mashelkar, Director, The National Chemical Laboratory (NCL), Pune is one among the five scientists selected by the Madhya Pradesh government for the 1991 Pandit Jawaharlal Nehru national award.

The other award winners are **Prof. A.L. Nagar** of Delhi University, **Dr. S.C. Dattaroy** of IIT, Delhi, **Prof. S. Chandrashekhar** of Raman Research Institute, Bangalore and **Prof. S.V. Kesar** of Punjab University. The winners received the award, carrying a cash prize of Rs. 1 lakh and a citation given away in Bhopal by the Madhya Pradesh Chief Minister, **Mr. Sunderlal Patwa,** an official release said. **Mr. T.K. Mukherji, Mr. C.M. Sharma** and **Mr. P.S. Shivaraman** of BHEL, Bhopal, have been chosen for the Lajjashankar Jha award, carrying a purse of Rs. 50,000 and a citation, for their services in the field of technology.

The 1990 Pandit Jawaharlal Nehru national award would be given away on the occasion to **Prof. Yogendra Singh** of New Delhi, **Prof. B.V. Shrikantan** of Bombay, **Dr. Nityanand** of Lucknow, and **Dr. A.P.J. Abdul Qalam** of Hyderabad, the release said. The 1990 state-level awards announced are the Dr. Hari Singh Gaur award for **Prof. B.K. Pasi** of Indore. Dr. Kailash Nath Katju award to be shared by **Dr. Hiresh Chandra** of Bhopal and **Prof. K.K. Pandey** of Indore, while the Lajjashankar Jha award would be given to **Dr. T.C. Rao** of Bhopal.

Coal-based fert. units to be revamped

Union Minister of State for Fertilisers and Chemicals, **Dr. Chinta Mohan** has said that his ministry had embarked on a massive plan to revamp coal-based fertiliser units to boost production in order to meet the requirements which had been rising by eight per cent every year.

Addressing a press conference at Rudrapaka village, 75 km from Vijayawada on June 21, he said atleast Rs. 5,000 crores were required to modernise the existing fertiliser plants whose technology was outdated.

These plants could not run with full capacity utilisation to meet the growing demand due to short supply of coal, he said.

He said the Ramagundam plant itself required Rs. 400 crores for modernisation. He said a plan had been submitted to the Planning Commission for approval in respect of all these plants. If necessary, efforts would be made to secure foreign aid for modernisation of the plants.

Dr. Chinta Mohan said neither naphtha nor natural gas could be supplied to the plants at Ramagundam, Haldia or Talcher as the sources of these materials were quite far off even if the technology was switched over. Laying pipeline of one km required Rs. 1.5 crores, he added.

He said it was decided to open one new fertiliser plant each year in the Eighth Plan period following the delicencing policy. Two more plants would be opened between Narsapur and Kakinada in the Godavari-Krishna delta, in addition to the existing two plants at Kakinada, in the next 33 months.

He said the demand for fertiliser nutrients at present was 220 million tonnes while the production was five per cent less. He said the demand for fertilisers was so high in neighbouring countries that Nepal was buying them from the Indian government at Rs. 7,000 per tonne. At the same time, he had been subsiding the farmers on fertilisers to the tune of Rs. 5,000 crores, he added.

The Union minister said the government could not take the risk of cutting down the fertiliser subsidy to farmers as it was committed to the welfare of the farming community.

The cost of production stood at Rs. 7,000 to Rs. 9,000 at places like Ramagundam whereas it was about Rs. 2,500 per tonne at other units even as the government was selling the fertilisers at very low prices incurring heavy loss.

Dr. S.N. Pandey, director (marketing) of the Krishak Bharathi Cooperative Limited said Guntur and West Godavari districts of Andhra Pradesh stood first in fertiliser consumption in the country and the state itself second after Punjab. Andhra was consuming 130 kg. per hectare of fertiliser as against 160 kg. in Punjab.

SQUEEZE ON SUBSIDY DISBURSEMENTS: FERTILISER INDUSTRY FEARS FUNDS CRUNCH

The Finance Ministry's decision to regulate the release of funds for fertiliser subsidy disbursement has resulted in the Fertiliser Industry Coordination Committee (FICC) ending up with virtually no funds to make payments on regular monthly bills, according to the fertiliser industry.

The Fertiliser Association of India (FAI) has said that out of the total provision of Rs. 5,000 crores in the 1992-93 budget towards fertiliser subsidy — which is being released in quarterly instalments of Rs. 1,250 crores each — only Rs. 950 crores was available for payment of subsidy on indigenous fertilisers during the first quarter this financial year.

Since payments of Rs. 850 crores h already been made out of a vote-o account budget, FICC has only Rs. 1 crores left with it and cannot disbur any further amount until July when t next installment is released, the associa tion claimed.

The industry is of the opinion tha unless supplementary grants are allowe or a decision to raise prices is take (they believe this won't happen unti August), a similar situation would per sist throughout the year.

The current quarterly instalments fal short of the actual requirement by abou Rs. 700 crores, and there is no solution in sight of the possibility of arresting escalating arrear claims and the high interest costs being settled, FAI said.

The financial crunch and the introduction of subsidy ceiling has resulted in over 40 plants being closed, and major plants producing nitrogenous and complex phosphatic fertilisers were finding it difficult in financing the purchase of basic raw materials and intermediates, says the industry.

The industry says that it is prepared for total decontrol of fertiliser pricing and distribution, but the lack of an administrative decision was causing difficulty because of other factors like the devaluation of the rupee, increase in gas prices, gulf surcharge and increase in railway freight.

FAI said that although the industry had been in the grip of a financial crisis for the last few years due to intermittent stoppage of subsidy payments and denial of escalation claims, it assumed serious proportions during the last financial year because of substantial "under provision" in that budget for the disbursement of subsidy.

Insecticide from Indian lilac

Environmentalists have since long been campaigning against the indiscriminate use of DDT and other chlorine-based compounds for the protection of crops from pests and prevention of insect-borne diseases.

Accordingly, attempts have been made from time to time to manufacture less polluting and more "environment friendly" insecticides, only that these have proved to be mostly ineffective, if not counter-productive.

It is in this context that the discovery of azadirachtin assumes relevance. Derived from seeds of the Indian lilac (botanical name: *azadirachta indica)*, the insecticide is considered to be not only safer and less polluting, but also much more effective than DDT and other synthetic compounds.

According to recent field trials, it acts on as many as 128 different varieties of crop pests including the gypsy moth, Japanese beetle, aphid, tobacco budworm and boll weevil.

The seeds are quite effective when dissolved in water. The solution is absorbed by the roots and is transported through the stem to leaves, making the plant highly resistant to pests. It disrupts the feeding of pests on the leaves, and thereby their growth rate.

Researchers at the Indian Toxicological Institute, Lucknow, recently discovered that the leaves of the Indian lilac tree tend to absorb more dust and gases from a polluted environment than any other botanical species. It showed the tree has a cleansing effect on the atmosphere and helps restore the ecological health of a region.

In view of these advantages, the US Environmental Protection Agency (EPA) has approved the marketing of Indian lilac formulations on a global scale. The azadirachtin content in seeds is estimated at 0.26 per cent. However, the major triterpene constituent of the seeds and fruits of the tree has not yet been synthesised, owing to its complex molecular structure. Best known as an anti-feedant, azadirachtin is non-toxic to human beings and birds.

In fact, the fruit is supposed to be a favourite with birds. Some animals however reject it owing to its bitter taste. The twig of the tree is often used as a chewing stick in villages to prevent dental infection.

Farmers are known to use leaves of the Indian lilac to protect their grains from insects. Research by British chemists have revealed that azadirachtin is actually a complex molecule made up of two components — one of which is an anti-feedant and the other serving as an insecticide. This composition makes it virtually impossible to reconstruct a molecule in laboratory conditions.

In fact, the credit for discovering these attributes rests with David Morgan and John Butterworth, two chemical analysts of the University of Keele who first extracted azadirachtin from the Indian lilac in 1968. However, it was not till 1988 that its chemical structure could be analysed by means of X-ray crystallography, thanks to Steven Ley of the Imperial College, London.

Ley and his colleagues recorded their finding of an assembly of 16 asymmetric carbon atoms to a molecule, each with two orientations — the object and the image. Consequently, there can be many permutations and combinations of the atoms before arriving at the desired molecular structure.

Ley succeeded in constructing the left (or the poisonous) half of the azadirachtin molecule. A few years later, Jim Anderson, a member of Ley's group, made the right half and ascribed the antifeedant quality to it. Neither could however join the right and left halves to construct a complete molecule.

Among the leading scientis Stephen Smith and Anthony Wood working on the possibilities of comb ing the two halves in laboratory co ditions. A breakthrough is expected th would create a modified version azadirachtin, as effective as the pare compound.

SUSTAINABLE DEVELOPMEN OF CHEMICAL INDUSTRY STRESSED

Compliance with pollution standar in chemical and petrochemical indu tries in Maharashtra requires a muc larger effort than at present. As man as 19 distilleries have not compiled wit pollution standards, observed **Mr. V.K Majotra,** Joint Secretary (Chemicals Ministry of Chemicals and Fertiliser

Addressing a conference on pollutio safety and hazard management in che mical and petrochemical industries i Bombay, he said of a total of over 10 units, 41 dyes and dye intermediate units have partially adhered to pollutio control norms.

He stressed on the emerging concep of sustainable development where economic growth is achieved withou depleting the stock of natural resources and degrading environmental quality.

Mr. Majotra said the government was very much concerned about safe transportation of hazardous chemicals and other substances so as to minimise any loss to human life and property.

After detailed deliberations, the conference recommended that pollution should be prevented at source, the best practical technical solutions should be encouraged, developed and applied, and the polluter should pay for the pollution. The public should be involved in decision making and implementation of provisions related to environmental protection, safety and hazard management in chemical and petrochemical industry.

'Commitment to southern gas grid stays'

An ambitious Rs. 7,200 crore project to eliminate oil flares that cut heavily into the production of oil and natural gas in the country, has been prepared with the aid from World Bank and Asian Development Bank (ADB), the Union Minister of State for Petroleum and Natural Gas, **Mr. S. Krishnakumar,** said in Hyderabad on June 18. Talking to newsmen, he said the project, expected to go on stream early in 1994, would considerably reduce oil flares that account for the loss of 11 million of the 49 million cubic metres of gas produced per day in the country.

The western oil fields and those in Assam bear the brunt of the oil flares he said adding that the Ministry has been giving top priority for optimum exploitation of the country's oil and gas reserves. Mr. Krishnakumar added that the idea of a southern gas grid to meet the requirements of the South Indian States has not been given up. 'Nobody has shot down this plan', the Minister told newsmen, adding that he was confident that the 10 million tonnes per day minimum requirement projected by an interministerial task force for its viability would be met by the efforts of his Ministry. 'The inter-ministerial task force has gone into the issue of the southern grid and we are moving towards making it a reality', the Minister said. A linkage from the Western Oil fields — Krishna-Godavari and Cauvery basins — was being worked out, he added. Referring to the Ministry's expansion projects in Andhra Pradesh, he agreed that there was a delay in the State Electricity Board's 400 mw gas plant, as the ONGC has not yet taken a firm decision for the supply of gas. Mr. Krishnakumar said during the Eighth Plan, a Rs. 500 crore expansion programme has been chalked out for Andhra Pradesh which includes setting up of oil storage depots at Peddapalli, Ongole, Warangal, Rajahmundry, Cherlapally, Tadepallygudem and Renigunta. A Rs. 250 crore oil pipeline between Vizag and Vijayawada, oil terminals at Vizag and Kakinada and LPG plants at Kondapalli, Kurnool and Vizag are also planned, he added.

Mr. Krishnakumar said he had reviewed the programmes of the ONGC and the oil companies during his visit to the State. Keeping in tune with new economic policies, the Oil and Natural Gas Commission (ONGC) and Indian Oil Corporation (IOC) have been directed by the Ministry to give a detailed account of their capability to exploit the oil and gas reserves, based on which, the oil sector would be thrown open for investments and joint ventures with foreign and private sector companies, Mr. Krishnakumar said.

Mr. Krishnakumar said his Ministry had drawn up norms for the participation of foreign companies in oil exploration in India. 'So far foreign bidding has been invited for 13 of the 72 blocks and we have plans to undertake round the year bidding in future', he said. Stating that the country was falling short by 20 million tonnes of petroleum annually, Mr. Krishnakumar said 'we need an additional investment of $5 billion to implement our new projects which include developing seven new oil wells that will give a quantum jump in production. He said petroleum production had fallen this year to 25 million tonnes from 30 million tonnes last year. The country had to import 20 million tonnes of petroleum and 10 million tonnes of petroleum products, which accounted for Rs. 13,000 crores foreign exchange, he added. 'Our crisis is lack of funds for immediate investment, therefore, we are anxious to invite foreign investors and NRI's to participate in exploration, refining and conservation projects', Mr. Krishnakumar said.

Referring to the Krishna-Godavari basin, he said surveys have estimated a reserve of 960 million tonnes of oil and gas of which 136 million tonnes have been definitely established. It is proposed to raise the prodution from the present 1.2 million tonnes to four m[illion] lion tonnes in the basin with the expl[oi]tation of Ravva Oil Field Project, wh[ich] has a potential of 45 million tonnes [of] oil, Mr. Krishnakumar said. On [the] exploitation of gas reserves, he said g[as] based power projects would be giv[en] high priority and the Prime Minis[ter] himself had reviewed the situ[a]tion recently. A separate gas linka[ge] committee has been set up by the go[v]ernment to look into the issue, he adde[d].

R.K. NARANG IS NEW IBP CHAIRMAN

The Appointments Committee of th[e] Cabinet has cleared the appointment [of] **Mr. R.K. Narang** as Chairman of th[e] Indo-Burma Petroleum Company. H[e] will succeed **Mr. A.A.Niazi,** wh[o] retired on May 31. Mr. Narang [is] currently, the Executive Director of th[e] Oil Coordination Committee, whic[h] coordinates the entire scheme of petro[l]eum products production and distribu[tion], and also operates the oil poo[l] accounts. Official sources say M[r.] Narang has in-depth knowledge an[d] experience of the oil sector as h[e] worked in the IBP from 1976 to 1979.

In addition, he has functioned as chie[f] of the OCC for the last five years giving him a detailed perspective of the petrol[e]um scenario since the OCC prepare[s] the oil economy budget.

ENERGY CONSERVATION ACT BEING DRAFTED

The Petroleum Ministry is working on a draft Energy Conservation Act to regulate fuel wastage. Giving only brief details of the proposed Act, the Minister said that the Act would be mandatory on all types of users and would include a suitable penalty for offenders. The Act, backed by organisational systems, will be formed to enforce the rules laid down. From among the users of energy, it would be compulsory for various companies to undergo a regular energy conservation audit.

Rs. 550 crore outlay for Cauvery Basin oil exploration

An outlay of Rs. 550 crores would be made for exploration and exploitation of oil resources in the Cauvery Basin, Union Minister of State for Petroleum **Mr. S. Krishnakumar** said in Madras on June 20.

Addressing a press conference after visiting the Cauvery Basin installations of the Oil and Natural Gas Commission (ONGC) and reviewing the progress of work and future prospects with ONGC member, **Mr. S. Paintal,** and senior officials, Mr. Krishnakumar said the regional business centre of the commission in Madras would be strengthened so that the project could be executed quickly and more effectively.

The commission had so far invested Rs. 800 crores in the Cauvery Basin, the Minister said. Mr. Krishnakumar said while the ONGC could step up its exploration and exploitation efforts, private or foreign entrepreneurs would be given freedom to enter the oil field to meet national needs quickly.

The Minister added that the ONGC was not interested in developing marginal areas, as a consequence of which foreign companies would have to be allowed to exploit crude oil deposits. Another avenue would be to encourage joint exploration between ONGC and foreign companies. The Minister reiterated that it was the thinking at the Centre which led to the entire petroleum sector being thrown open to public investors.

The cause for the country's current low production of crude oil was primarily due to the peaking of wells in Bombay High, and the fact that the spudding of newer wells had been delayed by three to four years. This had resulted in oil imports of between 19-20 million tonnes this year and the initiation of negotiations to import nearly, three milion tonnes from the Commonwealth of Independent States (primarily from the Russian Federation), and about 1.1 million tonnes from Kuwait. He was evasive about whether talks were on with Iraq to import crude oil. Dependence on ONGC for crude oil has been the main restraining factor behind the poor performance, particularly in the Cauvery basin. This problem will be solved by arming ONGC's regional 'entities' with more powers to act on their own he said adding that ONGC would be given more autonomy soon.

The Minister addressed reporters after completing a review of projects in South India, particularly in the Cauvery basin. Following the field inspections, he directed ONGC technologists to establish new reserves and increase production.

Policy to allow private sector mining to be finalised soon

The Government has decided to allow coal mining in the private sector to develop captive power coal mines for meeting the additional demand of coal. The Coal Secretary, **Mr. S.K. Lal**, told a seminar in New Delhi on June 16 that necessary legislative formalities in this regard would be completed shortly.

He said the government has already identified the potential coal blocks, which would form the logical source of supply of coal to the new power plants, proposed to be set up in the private sector. Altogether eight proposals for a total capacity of 5,290 MW for setting up of coal and lignite-based power stations have been received by the Department of Power, he said.

The government has also appointed the Adviser, Projects, in the Ministry of Coal, as the nodal officer to assist and guide the private sector companies interested in coal mining, he said. The government would also empower Coal Controller to inspect, and issue appropriate instructions, under the Coal Mines (Conservation and Development) Act, with a view to ensuring scientific exploration of coal.

The Coal Secretary said the private sector party would have to take necessary steps for containing mining lease, environmental clearance, acquisition of land for infrastructural facilities and for obtaining permission from the Directorate General of Mines Safety for opening mine. Referring to facilities available to the private companies, he said geological report of the mining block would be made available on payment of a fee to the Central Mine Planning and Design Institute (CMPDI), Ranchi, who have carried out the geological investigation in the min block. Mining plan required to be s mitted under Rule 22 of the Minc Concession Rules would be cleared the Ministry of Coal within 8 weeks the application, provided all necess details, have been furnished alongw the mining plan.

Supporting facilities like water a electricity will have to be arranged the mine operator. However, during t initial construction period, such faci ties if available in the nearby existi mines, would be extended on tempo ary basis on payment of a charge, M Lal said.

The private company, he said, wou get benefit like assured supply of co of consistent quality, continuity c supply and flexibility in the quantity c coal required, control over cost of pro duction, and the time schedule of com missioning of the power plant an captive mine could be matched as pe actual requirement.

The Government has also decided t wash high ash varieties of coal t improve the overall quality of supplies

Implementation of this decision would need setting up of at least 20-25 coal washeries to process the coal being despatched to various consumers, particularly the power stations and cement plants, the Coal Secretary said.

It was in this background that it has been decided to invite private sector investment for construction and operation of coal washeries in different coalfield areas.

The success of the participation of private sector in coal-based power projects would depend on clearances and timely availability of coal supply, Mr. Lal said.

This new policy would also be extended, in due course, to other coal consuming industries like cement and steel, he said.

3 coal EOU's offered to France

This is for the first time, India is proposing to take up export oriented "integrated" coal mining projects with foreign collaboration. At least, three underground coal projects have recently been offered to the French government for its consideration.

The offer was made at the Indo-French working group of coal, held in Paris from June 9 to 12 last. The projects offered were: Ananta (belongs to newly formed Mahanadi Coalfields Ltd.), Gushick (belongs to Eastern Coalfields Ltd.), and Banora West (belongs to ECL), according to **Mr. S.K. Chowdhary,** Chairman of Coal India.

Mr. Chowdhary, who attended the working group meeting, told *The Economic Times,* that the leader of the French delegation, **Mr. J.P. Pery** had agreed to consider this new concept. And it was decided that a task force should scrutinise the new projects for identifying possible areas of collaboration. Mr. Pery, who is also head of the directorate of gas, electricity and coal under the Ministry of Industry of the French government, opined that the conditions presently prevailing in India were encouraging for the Indo-French joint cooperations.

Mr. Pery was of the view that the changes in Indian policy regarding the import procedures and the facilities given to the operating companies to find foreign currencies on the open market, would open the door to much wider range of French cooperation.

The leader of the Indian delegation, **Mr. S.K. Lal,** Secretary in the Union Ministry of Coal proposed establishing new export-oriented coal projects with French collaboration. He offered three underground projects. But, to begin with, Mr. Lal requested the CdF to consider the possibility of setting up a complete mine complex at Ananta block. The mine complex, as offered would include production of raw coal, coal washery and captive power plant. The French side is said to have agreed to consider this new concept.

Mr. Chowdhary, while elaborating the detail of the proposed Ananta underground coal mining project, said that project was proposed to be taken up with French financial assistance to the tune of FF 800 million.

The annual production capacity of raw coal from this coal project would be about two million tonnes. A coal washery of similar capacity would be set up. It was expected that about 1.2 million tonnes of washed coal would be available from the washery, and as per proposed plan, the entire quantity of washed coal would be exported to France to honour the commitment of buy back arrangement with the CdF.

The remaining 80 lakh tonnes of post-wash coal would be washed further to produce about 44 lakh tonnes of middlings which would be supplied to domestic power houses, while the washery rejects would be utilised to run a 30 MW capacity captive power plant, proposed to be set at the pithead.

CIL Chairman said that the basic idea was to set up the project with French assistance, and subsequently to back the loan money by way of exporting superior grade washed coal to France.

It was, however, highlighted by the Indian delegation that India had already made a great progress in the development of opencast mines, and as a result, the coal production increased from 80 million tonnes per annum in 1973-74 to 230 million tonnes in 1991-92, while the production would touch about 300 million tonnes in 1996-97 and about 400 million tonnes by the turn of the century.

Against this background, Mr. Lal said that the underground mines would have to follow similar development in order to meet the growing demand of quality coal. Considering the French expertise, the Indian delegation further proposed French cooperation in manufacture and use of latest mine safety equipment, latest equipment and instruments for coal quality control and the technology of coal washing.

To cut down avoidable delay in transfer of technology and procurement of equipment, Mr. Lal suggested an "omnibus agreement" covering deputation of experts, technical assistance, purchase of mining equipment, etc. The importance of having a proper alternative to imported spare parts for imported equipment was also highlighted.

ECL TO BE IN THE RED TILL 1994

The Eastern Coalfields Limited (ECL), which has incurred a cumulative loss of Rs. 840 crore, including Rs. 345 crore in the last year, hopes to come out of the red in 1994 when its production would reach 33 million tonnes.

According to a senior official of the ECL, though the company has secured two awards for excellence with a production of 24.51 million tonnes in 1991-92 and has set a 28 million tonnes target for this year, the company would only be able to prevent cash loss by achieving the production target.

However, the ECL and the West Bengal government have come to an agreement by which the company will not pay royalty (amounting to Rs. 30 crore a year) to the government but would supply coal to the latter for the power plants in the state.

This exchange was decided upon to minimise ECL's financial crisis, the official said. On the other hand, power generating bodies, including DVC, owe ECL Rs. 234 crore, he said.

Nepal to import 0.5 million tonne of non-coking coal

Coal India Ltd. (CIL) has made a major breakthrough in its endeavour to penetrate the Nepal market in a big way. Satisfied with the terms and conditions, price as well as the quality of Indian coal, the Nepal government has agreed in principle, to import in hard currency, about five lakh tonnes of non-coking coal per annum, from some selective mines of CIL. This is the first time that Nepal is being asked to pay in hard currency for Indian coal.

An agreement in this regard between Coal India and Nepal Coal Ltd., a government of Nepal undertaking, is to be signed at the end of the current month. Available information suggests that the Nepal government is in favour of allowing private sector enterprises to directly import Indian coal. As things stand now, Nepal Coal Ltd., is likely to import 50 per cent of the total contracted coal, while the remaining 2.5 lakh tonnes would be imported by private parties there.

Pricing of coal to be exported to Nepal has already been worked out and negotiated along with a disincentive strategy for Ranigunj coal and a simultaneous attractive package for coal from the mines of North-Eastern Coalfields (NEC) and Northern Coalfields Ltd. (NCL). It has, however, been worked out that the average ex-pithead price of grade 'A' and 'B' non-coking coal would be about Rs. 560 per tonne.

The transportation cost would, however, be borne by the parties in Nepal. The breakthrough in coal export to Nepal has been made with successful discussions between a high level Indian coal export delegation and the concerned agencies of the Nepalese government. The Indian delegation led by **Mr. S.K. Chowdhary**, CIL Chairman, had recently visited Kathmandu to finalise the coal export deal. The Indian side suggested that the Nepalese government should plan for small thermal power houses with generation capacities ranging between 10 and 20 mw at suitable locations based on modern technology like FBC, where inferior grades of coal can be efficiently utilised.

The CIL Chairman assured the Nepalese authorities that such coal could easily be made available to them from Indian sources at a much cheaper rate. This sort of power houses, if set up, would help Nepal to augment their power generation.

Long flame grade 'D' from NCL was also offered by the Indian delegation. Since the source of this grade of coal is within reasonable distance from the Nepalese border, the transportation problem will be minimum, subject, of course, that the Indian Railway agrees to take responsibility of carrying coal from NCL mines to destinations in Nepal.

In the event NCL coal could not be moved, alternative arrangement for supply of steam coal from Dankuni Coal Complex had been made, and transportation for this by road, upto the border points would be undertaken by CIL through appointed road transport agencies. The cost of such transportation would be added to the ex-DCC plant price to arrive at ex-border price.

During negotiations, it is learnt that 'CILCOKE' was also offered at the prevalent Indian market price with the provision of road transportation to Nepal border points to be arranged by CIL.

The transportation cost was proposed to be added at ex-border price. Meanwhile, in a bid to grab a substantial share of Bangladeshi coal market, the CIL management has decided to send a high level team to Bangladesh early next month.

ORDER NOTIFYING CONTR
ON COAL USAGE

The Union Government has rece
issued a notification amending the C
ery Control Order to protect the in
est of actual users, according to C
Ministry sources. The amendm
would be effective from July 1 this y

Coal will be allotted to actual us
on the basis of the existing system
linkages and sponsorships, the sour
said, adding that coal consumers wo
continue to follow the system as th
was no change in the procedure
them. But coal allotted to them had
be used for the purpose for which it h
been allotted. Violation of the pro
sions of the Colliery Control Order w
punishable under the Essential Co
modities Act, 1955.

However, coal sold under the liber
alised sale scheme without actual us
condition and non-coking and cokin
coal produced in Assam and Megh
laya which was not required for meta
lurgical consumers had been exempte
from distribution control, sources sai
The sources said these exemptions f
coal produced in these two states, how
ever, did not apply to coal produced i
the mines of Coal India Limited (CIL
or any of its subsidiary companies.

Giving the background for the nee
to amend the order, the sources said dis
tribution of non-coking coal and cokin
coal not required for metallurgical pur
poses was decontrolled in July 1967 bu
the regulation over distribution of coal
specially by rail route, had been conti
nued.

The sources said priority in distri
bution and movement of coal by rail
was being given to actual users of coal
based on the recommendations of the
concerned sponsoring authorities. How
ever, instances were brought to the
notice of the government where people
were indulging in the resale of the coal
obtained for their own use.

37 million tonne coal destroyed in mine fires

The mine fires in coalfields of Jharia and Raniganj have so far destroyed 37 million tonnes of coal a large part of which is prime coking coal, according to a study prepared by the Coal India Ltd. (CIL), and reported in *The Financial Express*. Access to 1,860 million tonnes of coal is blocked because of the fires, valued at Rs. 70,000 crore.

Through fire control measures, CIL has been able to save coal worth Rs. 4,388 crore. While it is well-known that vast areas of the Jharia coalfields in the Bharat Coking Coal Ltd., (BCCL) are under fire for many years, it is not so well-known that at least seven mine fires are also raging the Raniganj area of the Eastern Coalfields Ltd. (ECL). These seven fires cover an area of about 600 hectares and are spread over the collieries of Sitaldasji, Bonjemehari, Dalurband, Khas Kajora, J.K. Nagar and Amritnagar. According to the report, one of the fires at the Raniganj coalfields is threatening the Sanctoria village. Another fire, if not controlled, may affect the Eastern Railway main line. The total area affected by fire in Raniganj is estimated to be over seven square kilometres. While the first fire in the Raniganj coalfields was reported as early as 1865, in the Jharia coalfields, mine fires are raging at 70 places since 1916.

During the two decades of its existence, the CIL has been able to extinguish five major fires. These fires, posing a major challenge to mining engineers of the country, have affected five out of the 18 coal seams in the Jharia coalfields. The value of the coal destroyed is estimated at Rs. 1,100 crore and nearly 225,000 residents have been affected. In Jharia, over 17 square kilometre of land is under fire as against the total mining area of 258 square kilometres. The causes of the fire at Jharia, according to the survey, are mostly found in spontaneous combustion occurring either underground or on the surface. Such combustions had taken place because of unscientific mining, practised by former private operators. Such fire are not difficult to control at the initial stages. But, these fires can spread fast, and once they assume extensive proportions, they can continue unabated for decades with high intensity.

Apart from destroying prime coking coal, these fibres have also polluted the environment by affecting air, water and land. Such fires increase the salinity of water, rendering them unfit for agricultural use, and lower water table. The CIL, according to the study, has so far spent Rs. 71 crore in three projects for controlling mine fires in Jogta, Angarpathra and Rajapur. The BCCL has formulated a fresh plan for controlling fires at 22 projects, involving an expenditure of Rs. 1,500 crore. Steps have been taken to control the spread of the mine fires. The CIL has also planned to take the help of the World Bank in controlling the mine fires. In fact, a six-member team of the World Bank has already visited the sites of coal fire in Jharia during the past few months to assess the extent of the damage and to suggest the quantum of assistance required.

Recently, a three-member team of scientists and technologists visited the United States to finalise the use of three technologies offered by them to control mine fires, especially at the Jharia coalfields. The United Nations Development Programme (UNDP) has also offered to finance the projects to control fire.

Scientists of the CIL are now using inert gases to render the fire areas deficient in oxygen. The method was tried for the first time in Sudamdih colliery of the BCCL. The second experiment took place at the Tastra colliery. The emphasis is now on more research and development activity to improve the effect of the new method.

Gas shortfall to hit southern projects

Power, fertiliser and petrochemicals projects in the southern region will be severely affected by the expected shortfall in availability of natural gas from the Krishna Godavari basin. With the earlier estimates of gas availability in the region going awry, the Petroleum Ministry has now indicated that the total availability of gas in the KG basin is estimated at 3.6 million cubic metres per day (MCMD) for the later period of the Eighth Plan (after 1995) and not 6 million as envisaged earlier.

The latest assessment presented to the Prime Minister's office recently, shows that the Petroleum Ministry and the Oil and Natural Gas Commission have overcommitted themselves in allocating gas to the consumers in this region for the period.

As a result, the fate of a number of projects with gas as the feedstock which were planned to be set up in the region, is quite uncertain. This has put the promoters of these projects in a fix as they have already incurred a lot of expenditure in planning their projects based on the earlier estimates of gas allocations.

This is expected to have serious ramification on planning of future projects in this belt. Sources say that the Petroleum Ministry has already informed the Andhra Pradesh State Electricity Board and the Kakinada unit of the National Thermal Power Corporation that it will be unable to honour its assurance of gas supply to the tune of 1.5 MCMD to each of these units.

The plan to set up a medium-sized urea plant in the Krishna Godavari basin might also have to be shelved because of this projected shortfall in the availability of natural gas. Earlier 0.5 MCMD of gas had been allocated for this plant.

According to the original allocation projections, a total of 1.75 MCMD of gas was to have been available in this basin till 1993-94. Of this, 1.3 MCMD was earmarked for Nagarjuna Fertilisers, 0.40 MCMD for the APSEB and 0.05 MCMD for miscellaneous consumers in the region.

By 1994-95, the projections envisaged that an additional 1.5 MCMD would be allocated for the APSEB, 0.34 MCMD for the Ganesh Petrochemical unit situated in the basin and a further 0.32 MCMD was to be set aside for LPG extraction.

The revised allocations as of now provide for supply of 1.3 MCMD of gas to Nagarjuna Fertilisers, 0.40 MCMD to APSEB, 0.05 MCMD to miscellaneous industrial consumers, 0.34 MCMD to Ganesh Petrochemicals, amd 0.32 for LPG extraction after 1995.

Even these allocations are marginally higher than what will actually be made available to the plants. Official sources point out that generally allocations are made 12.5 per cent higher than the actual estimated availability to provide for what is described by planners as the diversity factor.

This allowance takes into account the fact that while consumption demands for individual plants are estimated on the assumption of constant operations throughout the year, the actual consumption turns out to be less because of necessary stoppages like maintenance shut downs.

The latest cutback in gas supply in this basin is also expected to deter future investments in the southern region as a whole. Though some experts believe that the situation of severe shortage of gas supply could be somewhat redeemed when alternative supply is available from the Cauvery basin, for the time being, the prospects of such relief are not very bright. In comparison with the Krishna Godavari basin, projections of gas supplies in this region are rather modest.

CNG PROJECT SET TO TAKE OFF

The experiment by the Mad Refineries Ltd. (MRL), Cholan Ro ways Corporation (CRC) and ot agencies to run vehicles on compress natural gas (CNG) is poised to take in future, though expansion plans are to be worked out.

Scepticism over the economic vi bility of project was the reason f MRL, CRC and other agencies n working out the expansion plan according to MRL technicians' tea manning the CNG station.

They told a team of visiting new men that though the project had com to stay, the goal of achieving a 100-pe cent switch over to CNG, as worked o in the US and other countries, was fa fetched as using CNG and diesel in th ratio of 40:60 worked out to be costli than diesel.

The use of gas, available in plenty i the Cauvery basin, as an alternative fue could result in saving a vast amount o foreign exchange, involved in purchas ing diesel.

The CNG plant has been connecte to the gas pipeline linking Nagapatti nam with the Cauvery basin. Gas is als being supplied to several industries i Thanjavur and Quaid-e-Milleth districts

The experiment to run the buses o CNG was conceived to take maximum advantage of the gas availability, the MRL technicians said, adding tha though the cost factors had not been worked out to launch the project on a massive scale, the needed infrastructure to switch over fully to CNG would be created after the results of the experiment were analysed. The Rs. 40-lakh experiment of running six buses on CNG began during the last week of February.

NRI consortium likely for Dankuni power plant

A consortium of Non-Resident Indians (NRIs) is likely to set up a coal gas-based power plant at the Dankuni coal complex (DCC) of Coal India Ltd. (CIL) at an investment of around Rs. 70 crores.

Sources close to the coal industry said a group of three NRIs, having a tie up with the General Electric of the UK had already visited the Dankuni plant near Calcutta and was convinced of the viability of the project. The proposal was now being pursued with the various authorities at the Centre like the Cabinet Secretariat and the Central Electricity Authority (CEA), the sources said.

One-third of the 30 mw of power, which the project is expected to generate, would be utilised partly for captive consumption by CIL while the remaining — around 10 mw — would be fed into the State power grid, according to sources. According to the sources, if the project comes through, it would enable CIL to improve the capacity utilisation and the profitabity of DCC.

The DCC's capacity utilisation, primarily due to low offtake of the gas made by it, now hovers around 25 per cent while the average loss has been Rs. 25 crores every year since the commencement of commercial operation in 1990-91.

For the State, besides bringing in fresh investment, there would be additional power generation, the sources said. If in future the Greater Calcutta Gas Supply Corporation (GCGSC), the agency primarily responsible for gas offtake, is able to improve its offtake, more 'retort benches' could be set up, the sources added.

DCC, according to the sources, was originally envisaged to carbonise 1500 tonnes of sized prime raw coal from Ranigunj coalfields daily in five retort benches each consisting of 20 retorts. Side by side with trying to set up a gas based power station to improve gas utilisation, CIL is also trying to work out means of disposing its stock of 'Cilcoke'. Pointing out that the soft coke was made from Prime 'B' grade Raniganj coal, the sources said this was one of the joint products of DCC alongwith gas and tar.

The plant (DCC) commissioned at an investment of Rs. 150 crores is designed to produce 1000 tonnes of 'Cilcoke', 20 million cubic feet tonnes of clean pollution-free town-gas and 80 tonnes of tar daily. However, owing to the GCGSC's problems of gas offtake the capacity utilisation of the project has remained poor as CIL has often had to flare gas due to poor offtake.

The price of this gas at 8.50 per therm for domestic users has also constrained the operations and despite CIL tying up with the Durgapur Alloy Steel Plant last year for gas offtake, the demand for this 'pollution-free on the tap' fuel has remained low hindering any effort at capacity augmentation.

The souces said the need for capacity augmentation was there both on account of the demand for 'Cilcoke' and the need for having better recovery of the high value by-products from the tar. The tar distillation plant at DCC produced heavy, light and neutral oil and pitch besides chemicals like phenols, cresols, etc. which involved substantial value addition.

While admitting that since the revision in the price of CIL-coke there has been some problem of disposal, leading to stockpiling, the sources said CIL had gone in for open tender for selling its CIL coke which it felt was good value for money. The possibility of exporting this soft coke was also being explored, the sources said. While an export cell has already been set up for this CIL is trying to identify large customers within the country for a regular tie up for offtake of the Cilcoke, the sources added.

The efforts by CIL to enhance the profitability of the Dankuni coal carbonisation project is in line with the overall Government policy of turning around loss making units. Although there were rumours about 'privatisation' of the project, CIL sources said that they were not in favour of selling it lock stock and barrel to any private entrepreneurs but only bringing in a private enterprise to the extent required for improving the viability of the project.

While the State Government has on and off tried to help by tacitly pressurising industrial consumers to opt for the coal gas as an alternative source of energy, to improve gas utilisation, nothing much has come off from such efforts as the users had failed to appreciate the long-term economy of using an assured source of fuel like coal gas. The laying of pipelines for which the State Government has reportedly spent around Rs. 55 crores is also not complete creating another bottleneck in the gas offtake, sources said.

POWER TARIFF HIKE HITS INDUSTRY IN MAHARASHTRA

Industries in Maharashtra, particularly the energy intensive units such as foundries, steel units, aluminium rolling mills and large engineering units, are severely affected due to steep increase in the energy tariff and various other charges by the Maharashtra State Electricity Board, according to a press release issued by the Confederation of Indian Industry.

The energy tariff for these units, which was Rs. 1.80 a unit before the hike, will now be around Rs. 2.25 a unit. The present hike comes in the face of the recessionary conditions where many units fear that their profitability will be severely eroded.

Plan to allow foreign firm in mineral hunt

In a significant move to attract foreign investment in the mining sector, the Government is proposing to open mineral exploration (for non-fuel and non-atomic minerals) to foreign companies.

According to the guidelines being drawn by the Ministry of Mines, the mining companies from abroad will be permitted to undertake the mineral exploration activities in India. As in South Africa and Australia, the foreign companies which shall invest in Indian mining sector will have to part with 30 per cent of the output on successful exploration.

These changes in the mining sector are being prompted by the new industrial policy which has ushered liberalisation in the whole industrial activity. It is felt that mining sector should also be freed from the shackles of control in accordance with the liberalised regime. The Government, it may be mentioned, already has a policy of foreign participation in exploration of oil and natural gas. Presently the mineral exploration and exploitation is mostly carried out by the public sector companies. However, the new Mineral Policy likely to be announced in the monsoon session of Parliament, will considerably open the mining industry to the private sector.

Changes will also be made in the Mines and Minerals (Regulation and Development) Act 1957 to foster participation of private sector from within the country and abroad for exploitation of mineral resources of the country. The mineral processing industry, it may be mentioned, had already been thrown open to the private sector as per the new industrial policy statement. In yet another confirmation of the move the Minister of State for Mines, **Mr. Balram Singh Yadav** has said that India is "actively considering" to de-reserve all the minerals, now reserved for the public sector, to facilitate investments from the non-resident Indians (NRIs) and best utilisation of economic resources. Inaugurating the fifth international conference of residents and NRIs in Detroit (USA), Mr. Yadav called upon the NRIs to play a "very useful role" both for bridging the resources gap for investments as well as for induction of state-of-the-art technology in the minerals and non-ferrous metals sector.

Pointing out the proposal to allow any company, registered or incorporated in India, an entry to the mining sector, the minister hinted at further policy amendments allowing greater liberalisation in granting of permission, long period of lease and more power to state governments. Mr. Yadav is on a 12-day tour of the USA, U.K. and Germany to explore possibilities of joint ventures and technology transfer in minerals and metals sector. Listing the minerals under consideration for de-reservation such as iron ore, chromium, manganese, lead, copper, zinc, gold, diamond etc., Mr. Yadav welcomed the foreign investments particularly for processing and metallurgical industries.

INDIAN TEAM OF BOILER MAKERS LEAVES FOR US

A six-member boiler manufacturers' team has left for the United States to explore the possibilities of technology transfer in specialised or niche products. The team will also discuss the possibilities of investment by US companies in the Indian power sector and of supplying boiler parts and components from India.

The team is led by **Mr. P. K. Hariharan,** chief executive of ISGEC John Thompson and comprises members of the Boilers and Unfired Pressure Vessels Division of the Confederation of Indian Industry (CII). Boiler production in India over the past three years h[as] been around Rs. 900 crores annuall[y].

While domestic demand is more [or] less met by domestic manufacturers, t[he] division expects that the demand ov[er] the next two five-year blocks beginni[ng] 1995 would require additional inves[t]ment in the boiler industry.

Given the projections regarding add[i]tions to generation capacity and expo[rt] growth, it is felt that there is need f[or] both technological upgradation an[d] modernisation of manufacturing facil[i]ties in India.

There are already several US companies that have collaborations wit[h] Indian manufacturers. Moreover, i[n] 1990-91, the US emerged as the secon[d] largest importer of boiler spares fro[m] India after Indonesia. It is also the larg[-]est importer of steam and vapour generating boilers, accounting for 33 pe[r] cent of Indian exports of these items.

The mission is a follow up of the memorandum of understanding signed between the CII and the American Boiler Manufacturers Association (ABMA). Besides taking part in the annual session of the ABMA the mission would visit leading manufactures in US, such as, Riley, Zurn, Tampella, ABB Combustion Engineering, Foster Wheeler and Cleaver Brooks.

FACT GETS Rs. 71 CR. FOR 1992-93

A sum of Rs. 71 crores has be[en] provided for Fertilisers and Chem[i]cals Travancore Limited (FACT) under the Department of Fertilise[rs] for projcts and schemes during t[he] year 1992-93 as against Rs. 39.[..] crores (revised estimate) in 1991-9[2]. The amount, an official release sa[id] comprises Rs. 45.65 crores to b[e] spent for continuing scheme[s,] Rs. 10.35 crores for new scheme[s] and Rs. 15 crores for re[-]newals and replacements.

IISCO modernisation faces rough weather

The controversial modernisation plan of the Indian Iron and Steel Company (IISCO), a subsidiary of Steel Authority of India Ltd (SAIL), has run a full circle with one of the main contenders for the job deciding to withdraw from the race for participating as joint sector partner for updating one of the oldest steel plants in the country.

The whole process of finding a joint sector partner for IISCO modernisation might come to a halt as those competent to do the job might not be willing to do the same because of the terms and conditions being laid down by the Steel Ministry. After having lost so much time and wasting much effort, the question that who will ultimately modernise IISCO remains open. The Steel Ministry wants to have the best of the both the worlds which unfortunately is not possible in the case of IISCO. On one hand the Ministry wants some private party to invest money in IISCO, while on the other it does not wish to give full control to the same for managing the affairs of the company.

The recently constituted committee of experts headed by **Mr. T.L. Sankar** to explore and to make recommendations on the private sector participation in the rehabilitation and modernisaation of IISCO, has various strings attached to it. According to the Steel Ministry itself, 'one of the most important guidelines to the committee of experts besides, a viable modernisation programme working on acceptable timeframe, is that, while identifying the most suitable partner for joint participation, the interest of employees of IISCO will have to be fully protected. There will be no retrenchment of workforce and the service conditions of the employees will be safeguarded'.

It is difficult that with so many strings attached any serious entrepreneur in the private sector would take up the gigantic task of modernisation of IISCO which could involve any amount beyond Rs. 6,000 crores. Even a successful and resourceful businessman like **Mr. Swraj Paul** dared not venture into IISCO and opted for Rs. 12,000 crore greenfield project. The Tatas, who were keen to take over the Visakhapatnam Steel Plant (VSP), had never shown any interest in IISCO although the latter has equally strong captive supply sources as that of Tata Iron and Steel Company (TISCO). Among the Indian business houses, TISCO was the most competent to accomplish the job as its own plant is older than that of IISCO.

Now Mukand Steel, which was one of the three companies selected by the SBI capital markets for modernisation of IISCO, has opted out of the race. Obviously because of the parameters under which the Steel Ministry wants the private sector to function. The other two prospective joint sector partners identified by SBI Capital Markets are Lloyd Steel and Ispat Pellatech of Mittals. These companies may have the requisite competence to accomplish the task, but will they be able to deliver the goods under the given parameters can always be questioned. For instance, Mittals are successfully running big steel plants in Trinidad and Tobago and Mexico, but they have not been able to achieve the same amount of success in India. The sudden entry of Usha Rectifier into the race for modernisation of IISCO remains a mystery. Although the Steel Minister has expressed his ignorance about Usha Rectifier joining the fray, the company's office in the fapital, could neither confirm nor deny the reports appearing in the press in this regard. The terms of reference of the Sankar committee is also typically bureaucratic and vague. It is not known whether the Sankar committee would entertain fresh proposals or it would only review the report prepared by the SBI Capital Markets to finally select the joint sector partner out of the three identified by the latter. According to the Steel Ministry, 'the Government have constituted a committee of experts to explore and to make recommendations on private sector participation in the rehabilitation and modernisation of IISCO. The committee comprising six members, will be free to invite outside experts to assist them in deliberations and will be assisted by SBI Capital Markets, which has already done some preliminary exploratory work, being commissioned by SAIL for this purpose'.

INDIA SELLS FOUR CARGOES OF NAPHTHA

The Indian Oil Co., has sold four cargoes of naphtha for late-June loading at a tender that closed on June 10, Tokyo and Singapore traders said. The IOC sold 20,000 tonnes of natural gas liquid at a discount of $27.53 per tonne to Japan spot market assessment, fob, Kandla, for June 21-25 loading, they said. It also sold 35,000 tonnes of heavy naphtha at a discount of $31.24 per tonne to US Gulf Coast unleaded gasoline spot price, fob Bombay for June 24-28 shipment. A 35,000-tonne cargo of light naphtha was sold at a discount of $17.49 per tonne to Japan spot market assessment, fob Bombay for June 21-25 loading. The IOC also sold 25,000 tonnes of light naphtha at a discount of $ 19.78 per tonne to Japan spot market assessments, fob Madras for June 22-24 shipment, traders added.

MANALI PETRO. PROFIT UP

The gross profit of Manali Petrochemicals is up to Rs. 100.42 lakhs during the year ended March 1992 from Rs. 83.94 lakhs in the previous three-and-a-half months operations. Sales have risen to Rs. 49.47 crores from Rs. 8.17 crores.

After depreciation (Rs. 8.40 crores against Rs. 2.06 crores), there is however, a net loss of Rs. 7.40 crores against only Rs. 1.22 crores last year. It proposes to issue rights shares at a premium of Rs. five per share.

Non-ferrous metals output declines

The production of important non-ferrous metals like aluminium and copper continued to dwindle for the second consecutive month in the current financial year with various units in the public sector recording negative growth and the private sector not being able to keep pace with the production targets.

Except for zinc and lead, the production of all other non-ferrous metals in April-May remained not only below target but also less than the output recorded in the previous year during the corresponding months. Against the actual production of 84,314 tonnes of aluminium metal in April-May in 1991, the country has been able to produce only 83,062 tonnes in the first two months of the current financial year. The output for the two months remained far below the target of 86,763 tonnes set by the Ministry of Mines.

Hindalco, the main aluminium producing company in the private sector has been able to do well by marginally improving upon the production figures of the previous year. Still the cumulative production in April-May remained below target.

Against the production target of 28,000 tonnes of aluminium metal for April-May, Hindalco was able to produce 27,896 tonnes. This was higher as compared to the production of 27,496 tonnes of aluminium metal in the corresponding period in 1991.

The performance of National Aluminium Company Ltd., (NALCO), the major aluminium producing company in the public sector, remained poor. NALCO, with an installed capacity of 2.18 lakh tonnes per annum, was able to produce 15,874 tonnes in May against the target of 16,500 tonnes.

The cumulative production for April-May remained at 31,031 tonnes which was lower than the actual output of 31,946 tonnes in the previous year. Another aluminium producing company, INDAL too recorded poor performance during April-May. The cumulative output for the two months at 9,582 tonnes was less than the production of 10,575 tonnes in the last year and much below the target of 11,730 tonnes in the current year. The power cut at INDAL's units is stated to the cause of poor performance.

The BALCO, which has an installed capacity of only 1 lakh tonnes, was able to do better than the last year but its output also remained marginally lower than the target. Against the cumulative production target of 14,533 tonnes for April-May, the company was able to produce 14,517 tonnes of aluminium metal.

The Hindustan Copper Ltd., (HCL) has been able to perform better in May but failed to achieve the cumulative target for April-May as far as production of copper cathodes was concerned. The production of continuous cast copper rods remained much below the expectations.

HCL, which has an installed capacity of 47,500 tonnes of copper cathodes per annum, produced 7,562 tonnes in April-May which was lower than the actual production of 7,821 tonnes in the last year and also below the target of 7,800 tonnes fixed for April-May 1992.

The shortage of imported copper cathodes continued to hamper the production of CC copper rods at HCL's Taloja plant which has an installed capacity of 60,000 tonnes per annum. Against the production target of 2,000 tonnes for May, it only produced 800 tonnes of CC copper rods.

The cumulative production for April-May at 2,141 tonnes was far below the actual output of 4,002 tonnes in the corresponding period last year and also against the target of 4,000 tonnes in the current year. The productio zinc by HZL and BZL at 19,121 to for April-May was higher than actual production of 15,133 tonne the corresponding period in 1991 also against the target of 15,000 in current year.

As far as lead is concerned, its out[put] by the HZL at 5,796 tonnes in Ap[ril-] May was more than the actual produc[-] tion of 4,076 tonnes last year [but] remained far below the target of 6,8[..] tonnes in the current year.

The output of gold continued [to] remain low as compared to the actu[al] production in the last year as well as t[he] target set for the current year.

Both BGML and HGML togeth[er] were able to produce 205.495 kgs [of] gold in April-May against the actu[al] output of 275.657 kgs in the previo[us] year and the target of 277.262 kgs in t[he] current year.

FLOAT GLASS PLANT IN NEW BOMBAY

A Rs. 500-crore modern float glas[s] plant will be set up near Bombay soo[n] as leading Japanese company, Asah[i] announced in Tokyo on June 22.

Mr. Osamu Wada, a spokesman o[f] the company, said that the float glas[s] project will come up in the Taloja In[-] dustrial estate in New Bombay, mos[t] probably with the co-operation of th[e] Tatas.

He said negotiations with Tata Exports on the project were at the fina[l] stages and permission for setting up the plant has already been obtained from the Indian government.

About 25 per cent of the production will be earmarked for exports mainly to Africa or the West Asian countries. The plant will have a total capacity of 25 million square metres with a thickness of two metres. Production is expected to start in early 1995.

Guidelines for DTA sales by EOUs issued

The following are the guidelines for the sale of goods in the Domestic Tariff Area (DTA) by export oriented units and units in export processing zones:

I. DTA sale entitlement upto 25 percent/15 per cent.

Paragraph 102 (b) of the Export and Import Policy and paragraphs 181, 182 and 183 of the Handbook of Procedures (1992-97) provide for sale of goods in the DTA by EOUs and units in EPZs upto 25 per cent or 15 per cent, as the case may be, of the value of their production. Such sales in the DTA will be governed by the following guidelines:

(a) The sale of goods in the DTA will be subject to the payment of the applicable duties as notified from time to time by the Department of Revenue, Ministry of Finance, Government of India.

(b) DTA sale entitlement will be applicable only to those goods that are approved for manufacture and export in the Letter of Permission/Letter of Intent. No DTA sale will be permissible if such sale is specifically prohibited in the Letter of Permission/Letter of Intent.

(c) Units may opt for DTA sales on a quarterly, half yearly or annual basis by intimation to the Development Commissioner of the EPZ concerned.

(d) Applications for DTA sales should be submitted within one year of the period of entitlement. The Development Commissioner of the EPZ concerned may, if he deems it fit, extend this period by six months.

(e) An application for DTA sale shall be accompanied by a statement indicating the ex-factory value of the goods produced (excluding rejects); ex-factory value of the goods actually exported; and the value of indigenous raw materials, components and consumables used in the manufacture of the exported goods. The statement shall be certified by an independent Cost/Chartered Accountant and endorsed by the Customs/Central Excise Officer having jurisdiction over the unit. The Development Commissioner of the EPZ concerned will determine the extent of the DTA sale admissible and issue an authorisation for removing a specified quantity of the goods to be sold in the DTA.

(f) If the goods sought to be sold in the DTA requires any quality control certificate under any Act/Rule/Regulation, the DTA sale will be allowed only after the production of such a certificate.

(g) DTA sale entitlement shall accrue only after the goods are exported during the relevant period as indicated under subpara (c) above. However, this requirement may be waived in the case of such goods which, in the opinion of the Development Commissioner of the EPZ concerned, require trial production in order to produce goods of exportable quality.

(h) Advance DTA sale permission in respect of trial production shall not exceed 25 per cent or 15 per cent (as the case may be) of the ex-factory value of the production envisaged in the first year. Such advance DTA sale shall be adjusted against the subsequent entitlement for DTA sale. The unit shall be required to execute a bond with the Development Commissioner of the EPZ concerned to cover the difference between the amount of duties paid on the advance DTA sale and the full duties applicable on such goods.

(i) The maximum DTA sale entitlement of 25 per cent or 15 per cent, as the case may be, is permissible if the value addition achieved by the unit is not less than the value addition stipulated in the Letter of Permission/Letter of Intent. In case the unit fails to achieve the value addition stipulated in the Letter of Permission/Letter of Intent, the DTA sale entitlement will be determined as follows:

(a) If the value addition achieve not less than 90 per cent of the va addition stipulated in the Letter of P mission/Letter of Intent, the unit v receive the full DTA sale entitlement 25 per cent or 15 per cent, as the ca may be

(b) If the value addition achieved less than 90 per cent of the value ad tion stipulated in the Letter of Permi sion/Letter of Intent, the DTA sa entitlement will be determined accor ing to the following formula:

Value addition percentage achiev

25 or 15 per cent (as the case may b

Value addition percentage stipulate in the Letter of Permission/Letter Intent. The DTA sale in both the case mentioned above will be permissib only if the value addition achieved is n less than the minimum level of valu addition specified for the item Appendix II of the Export and Impo Policy or where no such percentage specified in that Appendix, the min mum value addition of 20 per cent stip ulated in paragraph 97 of the Export an Import Policy.

II. Other sales in DTA

The following guidelines shall appl to the sale of goods in the DTA i respect of supplies specified in para graph 103 of the Export and Impor Policy and paragraph 184 of the Hand book of Procedures:

(a) The unit shall, at the time of appli cation, indicate the quantity and value of goods sought to be supplied in the DTA. If the sale is effected against an import licence held by the DTA purchaser, the Customs/Central Excise Officer concerned will allow such sales after making a suitable entry on the licence of the quantity and value of such sales permitted by the Development Commissioner.

The import licence shall cease to be valid for further imports to the extent of such supplies effected by EOU/EPZ units.

(b) If the goods proposed to be sold by the EOU/EPZ unit do not require an import licence, the unit may submit an application to the Development Commissioner of the EPZ concerned supported by the relevant documents.

The Customs/Central Excise Officer concerned will allow such supplies to the unit in the DTA against a Release Order issued by the Development Commissioner concerned. The Release Order will be issued in duplicate, the original being retained by the unit as evidence of export.

(c) The value of the goods supplied under (a) and (b) above will be treated as the FOB value of exports for the purposes of discharging export obligation and achievement of value addition.

III. General

The guidelines contained in this Public Notice shall supercede the REP Circular No. 18/88 dated 2.5.88 and 36/91 dated 11.9.91.

PROPOSAL TO LIBERALISE FERA TO BE REFERRED TO CABINET

The proposal to substantially liberalise the Foreign Exchange Regulation Act (FERA) is expected to be sent to the Union Cabinet for its approval soon. The Law Ministry will complete its examination of the proposed changes in FERA. Subsequently, the Finacne Ministry will refer it to the Cabinet, so that a comprehensive FERA amendment bill could be introduced in the forthcoming monsoon session of Parliament beginning in the first week of July.

The proposed liberalisation, on which the Finance Ministry has by and large given its stamp of approval, will seek to do away with most controls and restrictive features under the present FERA. Barring controls that are aimed at checking any capital flight abroad and capital transfers, almost all other regulations under FERA will be removed.

Government officials are reluctant to give details of the proposed changes in FERA, but admit that these will bring about a sea change in the law. The extent of the proposed liberalisation can be gauged from the fact that the amended FERA would be contained in one volume of less than 100 pages. The present FERA is contained in three volumes running in to several hundred pages. Many of the changes introduced through notifications during the last six months will also be incorporated in the amended FERA to obtain Parliament's approval to these liberalisaion measures.

According to official sources, the question of renaming FERA also figured during discussion among officials in the Finance Ministry. There was a view to change its name in keeping with the proposed removal of controls. But in the final analysis, this view was overruled on the ground that a rechristened FERA might create avoidable political problems for the ruling party. Political opposition to a renamed FERA would be more than to an amended FERA, it was felt.

The proposed changes will substantially reduce the Reserve Bank of India's powers under the existing FERA rules. At present, for a variety of transactions involving foreign exchange the specific permission of RBI is required under FERA.

Under the amended FERA, such clearances will not be ordinarily required. The RBI will of course retain its powers in all cases of capital transfers. For instance, investment abroad will continue to be under the purview of FERA and subject to RBI supervision.

Customs rules simplified

In a move to simplify and rationalise customs laws, the Union government has introduced the facilities of a green channel for import cargo, self-assessment of import documents and duty liability by importers themselves and easier imports through international courier services.

The simplified customs rules and procedures have been introduced with a view to responding to the recent liberalisation in economic, industrial and trade policies and to the demand for easier customs laws to help exporters.

The green channel for clearance of import cargo will mean goodbye to the existing practice of subjecting each and every cargo to a physical examination before its release. Under the new scheme, cargo imported by importers of proven identity and unblemished record as well as private sector undertakings would be cleared without examination. Only 10 per cent of consignments would be selected at random for physical check.

The new self-assessment scheme will mean that for certain category of goods, the importer will self-assess the goods, determine his duty liability and on that basis pay the duty. The goods will be subject to only a percentage examination at the docks. This will replace the present scheme, under which import documents are completed by importers, after which they are appraised and assessed by the customs officers.

The new scheme, however, will apply only in respect of goods for which practice of assessment has been settled and there are no disputes regarding classification or valuation. To begin with, this facility will be extended to importers with proven identity and unblemished record of past conduct, apart from government departments and undertakings. The customs authorities will of course conduct post audit of import documents cleared under the scheme. Any breach of trust by the trade will invite penalty. In line with the practices prevalent in major trading countries, the government has also decided to make imports through international courier services easier. The level of duty has been reduced and the value up to which the articles can be imported through the courier service has been enhanced.

Similarly, bona fide commercial samples, which were so far restricted to Rs. 200 for duty free imports, are now allowed up to Rs. 1,300 under the new simplified customes rules. Also several measures have been introduced to rationalise clearance of import and export cargo. These include: reduction in the number of stages for processing of export documents; rearrangement of counter so that the flow of documents is uni-directional; allowing stuffing of containers in the factory premises in respect of export cargo and; introduction of a revised format of the shipping bill. The revised format will benefit the trade in terms of reduction of forms like quality control certificates, quota clearance, receipt of payment for port trust charges etc.

In a bid to reduce delays in clearance, the government has introduced greater delegation of authority. The powers of assistant collectors and deputy collectors have been enhanced. Export documents in certain prescribed categories are not required to be put up to the assistant collector. The import documents up to Rs. one lakh will now be assessed by the appraisers and the powers of appraisers to grant duty drawback has been enhanced.

The government plans to increase the number of institutes and laboratories in the public and private sectors, which would be qualified to undertake laboratory tests and provide laboratory facilities to the government for such purpose. This has been done to de-congest the Central revenues control laboratory, where a large number of samples received cannot be handled by the relatively limited facilities available there.

MORE MODIFICATIONS TO EXIM POLICY SOON

The Government has planned to come out with further amendments and modifications to the Exim policy, announced earlier this year, by early July according to **Mr. D.R. Mehta,** Director General, Foreign Trade and Chief Controller Imports and Exports (CCI&E). This is being done so to help the industry fully avail of the benefits of the new Exim policy, Mr. Mehta told a workshop on 'Exim policy and procedures.'

Mr. Mehta, who was responding to issues raised at the workshop by the industry, said "in 1992-93 the value of imports is estimated to go up by about 50 per cent." The Indian industry has demanded that the Government should make further simplification of the procedures in the Exim policy in the wake of the other economic reforms being implemented in the country. Speaking at the workshop organised by the Confederation of Indian Industries (CII), **Mr. Subodh Bhargava,** Chairman, CII said, "in order to make the Indian industry globally competitive there is need for a reduction in import tariffs."

However, at the same time, "there is also a need for a comprehensive anti-dumping legislation lest the effects of reduced import tariff be made ineffective," he added. Amongst various changes sought in the policy by the industry, the main are as follows:

Imports for exports: Suitable provision be incorporated in the current policy to compensate the exporters for the withdrawal of provision for 'special Exim scrips.' — For duty-free licences, there should not be any value stipulation and all the advance licence/special imprest licence irrespective of value should be issued by regional licensing authorities.

Consortium to put up warehousing facilities in Rotterdam

ITC Ltd., JK Synthetics and Hindustan Lever are among a host of Indian companies which are taking part in a project to set up a warehousing facility in Rotterdam with the assistance of the Dutch Government says a report in *The Business & Political Observer*.

The project, floated by the Commerce Ministry, is aimed at gaining a foothold in the unified EC market. Sources say that the facility is the first step of India's marketing strategy for EEC-92. The warehouse will be necessary since Europe, which is moving towards a zero-inventory system, will look for parties who can supply goods at short notice.

Other companies which have expressed their willingness to take part are India Radiators Ltd., GTN Textiles, Rockhard Holding and Sachdeva Industries. The project, which also envisages the setting up of a distribution centre-cum-showroom, will involve only the Indian private sector. The companies will be required to set up the facility through a consortium approach, with one of them being the lead company and investing a major portion of the finances required. According to preliminary estimates, the warehouse will cost about $2 million. Of this 25 per cent will have to be provided by the Indian partners and the balance will be provided by the Dutch Government and banks in Holland.

The Rotterdam municipality, which has approved the project, has also offered to provide financial assistance for setting up a distribution centre with linkage with the warehousing facility. However, this is subject to the condition that Indian companies join hands with a Dutch forwarding company and a
make equal investment. Though o
sites in Germany and Belgium were
considered, Rotterdam was chosen
to its proximity to the hinterland,
large volume of cargo handled at its
and the infrastructure available.
items likely to be stocked in the wa
house include castor oil, rice, cash
spices, chemical and chemical produ
leather and leather products, carp
engineering goods, marine produ
tobacco, fruits and vegetables, jute
jute products and non-quota textile

However, industry has demanded t
it have the freedom and flexibility
alter the product mix depending up
the commercial viability, instead of f
lowing a rigid predetermined mix.

India's total exports to the EEC cou
tries is projected to rise to Rs. 36,0
crore in 1995-96 from Rs. 9,000 cro
in 1990-91. ASEAN countries, such
Indonesia, Malaysia and Thailand, ha
already established such warehousi
facilities in Rotterdam with the supp
of the Dutch Government.

EXPORTS REGISTER NEGATIV GROWTH IN APRIL

The exports during April, 1992, t
first month of the current financial ye
have recorded a negative growth rate
around eight per cent in dollar term
despite devaluation and partial conve
tibility of rupee aimed at acceleratin
exports. Even the exports to the gener
currency area (GCA), which we
showing a rising trend in the previou
months, have registered a 1.65 per ce
decline in April this year as compare
to the same month last year. Als
exports to rupee payment area (RPA
have shown a sharp decline of 49.39 p
cent mainly "in view of the uncertai
ities which continue to prevail in th
region", according to an official releas
All this has led to a deficit of $419.9
million in April this year from a su
plus of $ 51.44 million in the sam
month of the previous year.

Co-operation in science, technology urged

The international trading environment recently presents a picture of cut-throat competition wherein developed countries were seeking to control the vast markets represented by the developing world.

This was stated by MP and former state minister for Science and Technology **Mr. K.R. Narayanan,** inaugurating a two-day interaction meeting on technology transfer among the developing countries, in New Delhi recently.

The interaction meeting has been organised by the Indian Institute of Foreign Trade (IIFT) and the Department of Scientific and Industrial Research (DSIR).

There is a considerable debate on the transfer of technology but several billion dollars were being denied to developing countries through quantitative restriction on trade, limitations on trade in services and protective agricultural subsidies, he observed. He said that the developing countries should pick up sufficient courage and strive for increased cooperation among themselves in this situation.

He felt that science and technology constituted the core element of this cooperation. A precedent already exists in the example of the newly-industrialised economies which had utilised science and technology as an important element in their development process.

In his keynote address, IIFT director-general **D.K. Chatterjee** said that the trade among developing countries is just about one-fourth of their global trade and as far as trade in services such as know-how and technology are concerned is much less.

The recent earth summit in Rio has brought into sharp focus the differences in the perceptions of the steps to be taken to protect the future of mankind, particularly in the developing world, Mr. Chatterjee added. Other participants included DoE secretary **N. Vittal,** DSIR adviser **K.V. Swaminathan, Prof. S.K. Roa** of IIFT, Ministry of External Affairs joint secretary **Mr. P.S. Haer.**

The ambassadors and high commissioners from Zimbabwe, Kenya and Botswana were also present. The possibilities of technology collaborations among developing countries such as consultancy, joint ventures and licensing and identifying the areas offering opportunities for increased cooperation in technology transfer among the developing countries were the focus of the seminar.

AUTOMATIC APPROVAL LIST REVISED

The Industry Ministry after a review of the items included in the list of industries eligible for automatic approval for technology agreements and for 51 per cent foreign equity have made certain revisions in the same.

A Ministry press note said that the nomenclature in respect of certain items have been rationalised, certain items have been re-grouped, and some additional items have been identified. Some of the items under the Indian Trade Classification (ITC) coding system falling under the generic descriptions did not find mention in the ITC list of Annexure III of the release dated August 14, and 20, 1991. The extended list of these items was notified along with the press note of the Ministry on December 18, 1991.

The revised list for the purpose of automatic approvals is based on ITC. These in the case of large and medium industries include all the items reserved for the small-scale sector listed in Schedule III.

All items of electronic aerospace and defence equipment, whether specifically mentioned or not in the case of all industries, all items related to the production or use of automatic energy including the carrying out of any process, preparatory or ancillary to such production or use under the Atomic Energy Act 1962 are the areas covered by the list.

The items include metallurgical industries, boilers and steam generating plants, prime movers, electrical equipment, electronic equipment, components including subscribers and telecommunication equipment, transportation, industrial machinery, machine tools and industrial robots and their controls and accessories, agricultural machinery, earth moving machinery, industrial equipments, scientific and electro-medical instruments and laboratory equipment, nitrogenous and phosphatic fertilisers, chemicals, synthetic resins and plastics, drugs and pharmaceuticals, paper and pulp including paper products, industrial laminates, automobile tyre and tubes, rubberised heavy duty industrial bearings of all types and conveyor belting, cement products, high technology reproduction and multiplication equipment, carbon and carbon products, rubber machinery, printing machinery, soya products, hybrid seeds, hotels and tourism related industry, and all items of packaging for food processing industries.

ANIL STARCH

Anil Starch of Lalbhai group has incurred a net loss of Rs. 12.53 lakhs for the year ended March 31, 1992 as against a net profit of Rs. 5.36 lakhs in the previous year. However, the company has maintained equity dividend at Rs. 14 per share.

Sales of the company increased from Rs. 31.94 crores to Rs. 43.17 crores. Gross profit rose to Rs. 3.61 crores as against Rs. 2.17 crores in the previous year.

ASSOCHAM seeks changes in ID Act

The Associated Chambers of Commerce and Industy of India (ASSOCHAM) has called for substantial changes in the country's labour laws, particularly in the industrial disputes (ID) actand trade unions act, in line with the new economic policy to accelerate industrial growth and attract foreign investment.

A background paper prepared for the seminar titled "New industrial policy: Agenda for changes in industrial relations legislations" held in New Delhi recently said that a clear and rational industrial relations policy was necessary to tackle the problem of displaced workers caused by industrial restructuring in the context of economic reforms. The freedom of entry now permitted, the chamber felt, would not achieve the desired results unless there was simultaneous freedom of exit. It also said that in a free market situation units became sick for a variety of reasons like product or technology obsolescence or supply-demand conditions.

There was a need for a fresh look at some of the provisions of existing labour laws and procedures because unless industrial units were allowed to close down without loss of time the country would be flooded with sick units.

Chapter VB of the industrial disputes act, that has regulated relations between employees and employers for over 45 years, had a deleterious effect on industrial growth, the chamber commented. It, therefore, suggested that sections 25-M, 25-N and 25-O, relating to prior permission for layoff, retrenchment and closure respectively should be deleted and section 33, relating to service conditions, should be suitably amended. ASSOCHAM has disagreed with the report of the Working Group which recommended that the power to decide such matters be delegated to an in pendent authority, including BIFR has also suggested a moratorium fo period of five years on strikes, lo outs and go-slows, besides a gene norm that every strike must be pre ded by a ballot in which atleast tw thirds of the workers emloyed in establishment should vote in faour.

With a view to maintaining the se ular character and keeping militan under check, the chamber has urged f an amendment to section 4 of the Tra Unions Act to ban the registration such unions.

MARGINAL GROWTH IN IMPORT INTENSITY OF EXPORTS

Import intensity of exports has grow only marginally from 21 per cent i 1980-81 to just 38 per cent in 1989-9 Even at Madras, if the import of gem and jewellery is excluded, the impor intensity of manufactured export increased by an even smaller percen tage from 32 per cent to 42 per cen during the period under review. Mor remarkable is that this marginal increas occurred when manufactured export from the country grew impressively. Fo example, share of manufactured export in total exports rose from around 56 pe cent of total exports to as much as 75 per cent in the Eighties.

This is revealed in a study undertaken by the Export Import Bank of India which analysed the import intensity of five sectors namely leather and leather products, readymade garments, engineering goods, gems and jewellery as also chemicals and drugs. Taken together the five sectors accounted for 56 per cent of the country's exports. Even in the relatively capital-intensive industries like chemicals and drugs and engineering goods, the import intensity as a percentage of total exports stood at 31 and 28 respectively. And, gem and jewellery exports had, by far the highest import intensity of 78 per cent.

SPOTLIGHT ON

Biotechnology & Life Sciences

FAST DNA SEQUENCING TECHNIQUE DEVELOPED

Chemists at the University of Wisconsin, Madison, have developed an approach for significantly increasing the rate at which the fragments produced in DNA sequencing reactions can be analysed by gel electrophoresis. The research was described at a symposium sponsored by the Biotechnology Secretariat.

The technique, which utilises ultrathin gels, provides more than 9,000 bases of DNA sequence data per hour. Current commercial sequencing instruments produce about 1,350 bases of DNA sequence data per hour. And Llyod M. Smith, an assistant chemistry professor at Wisconsin who developed the technique, says that fairly straightforward extensions of the current design will enable construction of a system with a throughput of 26,000 bases per hour.

Smith points out that high-speed DNA sequencing is an absolute necessity if the human genome project and related sequencing efforts are to succeed. To date, about 50 million base pairs of DNA sequence have been published, about 6 million of which are from the human genome. The longest individual sequence that has been determined is about 300,000 base pairs in length. The DNA in the human genome contains on the order of 3 billion base pairs, which, Smith says, represents "a big hurdle to jump in sequencing capability"

Currently, virtually all DNA sequencing is based upon the separation of DNA fragments in high-resolution polyacrylamide gels of 200 to 400 µm thick. Over the past two years, Smith and others have shown that the time required for gel electrophoretic separations of DNA can be reduced using capillary gel electrophoresis. In capillary gel electrophoresis, fluorescently labeled products of sequencing reactions are separated and detected in 50 µm-diameter polyacrylamide gels cast in fused silica capillaries.

The high efficiency of heat dissipation in these capillaries permits much larger electric fields to be applied without damage from heating, yielding a concomitant increase in the speed of the electrophoretic separations, Smith says.

Capillary gel electrophoresis is, however, inherently a serial technique so that, although the separations are faster, overall throughput of DNA sequence by this method is roughly comparable to that of existing instruments. One could, of course, run a number of capillaries in parallel, but preparing gel-filled capillaries is itself difficult, expensive, and time consuming, Smith notes.

The alternative now being pursued by Smith and Wisconsin coworkers Anthony J. Kostichka, Michael L. Marchbanks, Robert L. Brumley jr. and Howard Drossman has been to develop an instrument utilising ultrathin — on the order of 50 µm — gel slabs [*Bio/-Technology*, **10**, 78 (1992)]. As with capillary gel electrophoresis, becasue the gels are thin, high voltages can be applied without damage from heating.

The instrument developed by the Wisconsin chemists can presently analyse the products of 18 DNA sequencing reactions in parallel. It utilises fluorescence detection, which is achieved with no moving components using a novel detector design based on a cooled, charge-coupled device array detector. All 18 samples, each about 600 nanoliters in volume and containing about 100 ng of DNA, are loaded and detected in a region only 1.8 cm wide.

Smith stresses that sequencing DNA is not simply separating and detecting DNA fragments. "That's only one part of the problem", he says. "There is also generating the fragments and handling the data that are generated. All of these are significant problems that remain to be overcome for the human genome project to proceed". (*C&EN*, 27 April 1992).

ISOTHIOCYANATE IN BROCCOLI MAY PROTECT AGAINST CANCER

Researchers have isolated and identified a key chemical in broccoli that strongly induces enzymes that protect against cancer [*Proc. Natl. Acad., Sci.*, **89** 2399 (1992)]. People who consume broccoli and other cruciferous vegetables, such as cauliflower, mustard, and brussels sprouts, are known to have a lower risk of developing cancer.

The protective effect is thought to be due, at least in part, to compound in these vegetables that induce so-called phase II detoxication enzymes, which are involved in the metabolism of carcinogens. Pharmacologist Paul Talalay and chemist Gary H. Posner of Johns Hopkins University, Baltimore, and their coworkers decided to search broccoli for these phase II enzyme-inducing compunds.

They fractionated broccoli extracts using preparative HPLC and examined the fractions using a cell-culture assay for phase II enzyme-inducer activity developed by coworker Hans J. Prochaska. To their surprise, they found that most of broccoli's enzyme-inducer activity resides in a single chemical entity, which they identified as (-)-1-isothiocyanato-(4R)-(methylsulfinyl) butane, also known as sulforaphane.

This compound's presence in plants has been known for more than three decades, and related isothiocyanates are known to have anticarcinogenic properties. But of all of the selective phase II enzyme inducers found in vegetables, sulforaphane is so far the most potent. Scientists are now eager to test the compound to see if it will block tumor formation in animals. Talalay is optimistic is will turn out to be an anticarcinogen. (*C&EN*, 30 March 1992).

TRANSGENIC PLANTS MAKE BIODEGRADABLE PLASTIC

For the first time, researchers, have genetically altered a plant so that it produces a biodegradable thermoplastic [*Science*, **256,** 520 (1992)]. The plastic, poly-D-(-)-3-hydroxybutyrate (PHB), is naturally produced by soil bacteria and can be used in containers, wraps, and coatings. The cost of PHB derived from bacterial fermentation, though, is "substantially higher than that of other biomaterials, such as starch of lipids, that accumulate in many species of higher plants", according to Chris Somerville of the Department of Energy's Plant Research Laboratory at Michigan State University, East Lansing, and his coworkers.

The researchers wanted to see whether the bacterial capability to synthesize PHB could be transferred to higher plants. To accomplish this, they introduced two bacterial genes into a plant that has a simple genome. The two foreign genes each encode an enzyme that is missing in the plant but is essential for PHB biosynthesis. The genetically engineered plants produced PHB granules that are very similar to granules observed in PHB-producing bacteria. However, the plants were stunted and produced fewer seeds than normal. Additional genetic manipulations will be necessary to produce large quantities of novel biopolymers in agricultural plants, the researchers conclude. (*C&EN*, 27 April 1992).

PROTEIN STRUCTURE MODIFIED BY CHEMICAL SYNTHESIS

A technique for protein structure modification developed by cell biologists Martina Schnolser and Stephen B.H. Kent of Scripps Research Institute, La Jolla, Calif, could provide a route to a wide range of protein analogs [*Science*, **256,** 221 (1992)].

The researchers demonstrate the approach by making a "backbone-engineered" HIV protease in which specific peptide bonds are replaced by thioester linkages. The modified protease is formed from chemically synthesised peptide segments that are linked together via mutually reactive functional groups.

The linkage reaction is nucleophilic susbtitution in which a sulfur nucleophile at the carboxyl terminus of one peptide attacks an alkyl bromide at the amino terminus of another, creating thioester analog of the peptide bond. The high chemical selectivity of this reaction makes it possible to carry out the ligation without protecting the other peptide functionalities.

This is a major advantage, because the need for protecting groups has been "the principal problem of the classical approach to the chemical synthesis of proteins", the researchers say. The chemical synthesis approach to variation of protein structure also conceivably could be used to make proteins incorporating fixed three-dimensional structure elements, proteins with two amino or carboxyl termini, proteins with nonnatural amino acids, and hybrid protein-nonprotein macromolecules, in addition to backbone-engineered proteins (*C&EN*, 13 April 1992).

PROTEIN ENGINEERING BY EXPANSION OF GENETIC CODE

Another method for incorporating nonstandard amino acids into proteins is reported by J.D. Bain and A. Rich Chamberlin of the University of C fornia, Irving, Christopher Switzer UC Riverside and Steven A. Benne Eidgenossische Technische Hochschu Zurich [*Nature*, **356,** 537 (1992)]. protein synthesis, a group of th nucleoside bases (a codon) on m senger RNA (mRNA) bind with a ser of three complementary bases (an an codon) on transfer RNA (tRNA).

This matching process results translation of the mRNA codon into o of the 20 natural amino acids, which then incorporated into the growing pr tein. Now, Benner and coworkers ha expanded the genetic code by synth sizing an mRNA and tRNA that co tain a new codon-anticodon pair mac from nonnatural nucleoside bases.

They then use these synthetic RNA to incorporate an unconventional amin acid (iodotyrosine) into a peptide. Th technique "offers new possibilities fc protein engineering", they say, an compares favourably with anothe recently described approach in whicl the genetic code is rearranged to get stoj codons (which normally specify chair termination) to code for amino acids (*C&EN*, 13 April 1992).

ANTIBODY PROTECTS CHIMPS FROM HIV INFECTION

A monoclonal antibody directed against a region of the human immunodeficiency virus (HIV) envelope glycoprotein (gp120) protects chimpanzees from infection with the virus, which in humans is the cause of AIDS [*Nature*, **355,** 728 (1992)], Emilio. A. Emini and coworkers at Merck, Sharp & Dohme Research Laboratories, West Point, Pa., working in collaboration with scientists from a number of other institutions, characterised a monoclonal antibody directed against the third hypervariable (V3) domain of gp120 from the IIIB strain of HIV. The V3 region — a loop containing 30 amino acids — had previously been shown to elicit strain-

pecific HIV neutralising antibodies. A himpanzee that had been administered he monoclonal antibody and challenged vith HIV_{IIIB} 24 hours later was proected against infection with the virus, he researchers report.

Additionally, a chimpanzee challenged with HIV_{IIIB} and given the nonoclonal antibody 10 minutes after he virus was injected also was protected from infection. Although the antibody s specific for a particular HIV strain, anti-V3 antibodies with broader neutralising activity can be elicited, the researchers say, which supports efforts o develop vaccines based on this region of gp120. They also suggest that an anti-V3 monoclonal antibody might prove useful for treating laboratory echnicians and health care workers exposed to HIV. (*C&EN*, 24 February 1992).

DYE CAN BE USED TO DETECT AMPLIFIED DNA

A new variation on the polymerase chain reaction (PCR) technique makes it possible to detect amplified DNA sequences without opening the reaction tube. The technique, developed by Russell Higuchi, P. Sean Walsh, and Robert Griffith of Roche Molecular Systems, Emeryville, Calif., and Gavin Dollinger of Chiron Corp., Emeryville [*Bio/Technology*, **10**, 413 (1992)], could facilitate use of PCR in clinical diagnostics testing, an area in which it is still not widely applied.

In part, this is because PCR-based diagnostic assays often require added labor-intensive steps (such as DNA hybridization, gel or capillary electrophoresis, or liquid chromatography) to determine whether a target DNA sequence had been present and successfully amplified.

Now, Higuchi and coworkers find that addition of a dye, ethidium bromide, makes it possible to detect DNA amplification from outside the PCR tube. PCR amplification of target DNA results in a large increase in the amount of double-stranded DNA present. Ethidium bromide can detect this increase because it exhibits enhanced fluorescence upon binding double-stranded DNA.

The ability to simultaneously amplify and detect specific DNA sequences may lead to more widespread use of PCR in the clinic or in other situations requiring high sample throughput, the researchers say. (*C&EN*, 13 April 1992).

A DNA SEQUENCER PROMISES TO SLASH TIME, COSTS

A laser-based technique being patented by two chemistry professors at Wayne State University (Detroit) promises to dramatically cut the time needed to decipher the human genome from 10,000 person-years to just three person-years — and at less than 10 per cent the cost. Currently, geneticists use time-consuming gel electrophoresis to separate DNA strands on the basis of charge-to-mass ratio and relative length, but the new method speeds this up several thousand times separating the DNA in the gas phase, says Louis Romano, one of the professors.

To "vaporize" the DNA, it is mixed with Rhodamine 6G, a blood-red dye that absorbs green light. When the combination is pulsed with a green laser, the DNA remains unaffected, but the dye, which absorbs the laser energy, is blasted into the air, carrying the DNA —still intact — with it into the gas phase. Once airborne, the DNA is separated by size. Next, each strand is again tagged with a dye, energised with a laser, vaporised, ionised, and analysed in a mass spectrometer. Besides providing speed, Romano says the method is safer than gel electrophoresis since it does not use toxic and radioactive reagents.

ENZYME ANALYSIS DONE IN NONAQUEOUS MEDIA

Use of noncovalently immobilised enzymes to carry out flow-injection analysis (FIA) in nonaqueous media has been demonstrated for the first time by Lorenzo Braco, Jose A. Daros & Miguel de la Guardia of the University of Valencia, Spain [*Anal. Chem*, **64:** 129 (1992)]. The researchers analyse cholesterol in urine using a procedure involving two enzymes, cholesterol oxidase & horseradish peroxidase.

The enzymes are co-immobilised by simple adsorption onto controlled-pore glass beads, which are then packed into an FIA flow reactor. Using this system, cholesterol can be determined at a rate of 60 samples per hour, with a detection limit of 10^{-6} M and linearity of response upto 1.8×10^{-4} M. The strategy, offers several advantages over enzyme-based FIA in aqueous media. For example, poorly water soluble molecules can be determined directly in the organic phase, and the need for time-consuming covalent immobilisation of enzymes (to prevent desorption in aqueous flow streams) is avoided because of the insolubility of enzymes in organic solvents. (*C&EN*, 27 January 1992).

CHARGE SEPARATION MIMICS PHOTOSYNTHESIS

Exceedingly long lived charge separation in an artificial photosynthetic system — upto a few hours in duration has been demonstrated by Anny Slama-Schwok, Michael Ottolenghi and David Avnir of the Institute of Chemistry at Bebrew University of Jerusalem [*Nature*, **355:** 240 (1991)]. The study is part of extensive research efforts by several groups to create an artificial form of photosynthesis. In natural photosynthesis, light energy is captured and stored by photo induced electron tra fer and consequent charge separation attempts to mimic this process, cha separation lasting a matter of minu has been achieved, but slowing do back-reactions that regenerate the n tral species has been difficult. S back-reactions limit the length of ti during which charge separation (hence energy storage) can be ma tained.

Now, Avnir and coworkers ha achieved photoinduced charge sepa tion of at least four hours duration some cases, albeit in low yield. In th system, an electron donor (pyrene) a acceptor (methyl viologen) are imm bilised in a porous sol-gel glass. T redox reaction is mediated by a thi mobile species that shuttles electro between the donor and acceptor speci which are trapped in the aqueous po spaces of the glass and hence separat from each other, thereby inhibiting t back-reaction. (*C&EN*, 27 January '9

Science Briefs

NEW FIBER-REINFORCED PLASTIC MATERIALS

Mitsui Toatsu Chemicals Inc in Japan has developed the new thermoplastic material reinforced with long fibers which are 2 to 6 times stronger than conventional fibers, reports *TechnoJapan*. The fibers, of glass or carbon, account for 70 to 80 per cent of the total weight. The composites can find use in various automobile parts, such as bumper beam that reinforces bumper, and will attract attention as the materials to reduce automobile weight.

In these plastic composites reinforced with long fibers, additives such as sizing and coupling agents are specially designed for their contents and starting materials, such as silane and urethane base compounds. The production facilities are so devised to disperse these fibers uniformly.

As a result, their fiber content is 70 to 80 per cent which is twice as high as that of the conventional fiber-reinforced plastic. Further, length of these fibers is 1 mm, versus 0.1 to 0.2 mm at the longest of the conditional reinforcing fibers. Such a high proportion of the reinforcing fibers increases bending strength from 40 to 150 kg/mm^2. In other words in the composite is 2 to 6 times stronger than the conventional one. The other advantages are high resistance to chemicals and hydrothermal conditions, and high fabricability resulting from high fusibility.

— P.T.I. Science Service
May 16-31, 1992, p. 10

EASY TEST FOR SERIOUS DIGESTIVE DISORDER

A simple and highly efficient test for coeliac disease, caused by intolerance to the gluten protein inherent in cereals, has been developed by research at Australia's National Science Organisation, CSIRO. Almost one in every 2000 Australians and countless thousands throughout the world have the intolerance, but the disease can be hard to detect with symptoms such as diarrhoea, infertility and weak bones. In severe cases, and if left untreated, sufferers, while eating normal amounts of food, may be starved. Project leader Dr. John Skerritt said coeliac disease affected the small intestine and caused the villi to flatten, making it impossible for the bowel to absorb nutrients from the food.

Testing for coeliac diseases involves an extended course of dietary changes, blood analysis and biopsies. Because of the nature of these procedures and the difficulty of diagnosis, doctors in many cases are reluctant to subject their patients to the extensive testing process.

The new test is simple to use and has proved 95 to 100 per cent effective in detecting the presence of coeliac disease. It has been developed from earlier research on the causes of an antibody responses to the disease. It works by detecting antibodies to a specific antigen, in this case the cereal protein gluten. A blood sample is taken from a suspected sufferer and serum prepared from the blood. The test result changes colour, depending upon whether the gluten antibodies are present in blood serum.

— P.T.I. Science Service
May 16-31, 1992, p. 12

ELECTRONIC COUNTER FOR COUNTING TINY PARTICLES

The French company Tripette Et Renaud has developed and commercialised an electronic counter for particles that are larger than 100 microns, but smaller than 15 mm, reports the French newsletter *Cedust*. The device called Numigral II could be used for fast and reliable counting of small items like seeds, grains, capsules, and pills. The Numigral II complements the Numigral I from which it was derived. Its ability to count items under the millimetre mark stems from the integration of state-of-the-art electronics, particularly the use of an infra-red optical electronic sensor that can systematically disregard any foreign particle that does not have the required dimensions.

A micrometre screw keeps out large impurities. The machine memorises the minimum size of the item being measured: consequently any smaller particle is considered an impurity. The size and quality of the items that need to be counted or downcounted are programmed and memorised on the Numigral II.

The recorded results are edited and dated on its internal printer. An RS-232 serial port offers the possibility of connecting the unit to a computer, the *Cedust* report said.

The Numigral II is equipped with a universal bowl that is kept in place by an electromagnet. Its level of vibration is automatically adjusted and memorised. It can also be adjusted manually. The counting speed automatically slows down towards the end of a cycle. This avoids the build-up of a surplus. At the end of each counting cycle, an electronic "beep" is sounded.

— P.T.I.Science Service
May 16-31, 1992, p. 12

NEW GENERATION LUBRICATING OILS

As science and technology advances, Oil Engine Manufacturers (OEMs) make engines of new designs. Care is taken in this process that the new generation engine will consume lesser fuel and cause lesser damage to our environment through its exhaust, thus enhancing oil conservation and controlling air-pollution. Obviously, the scientists and technologists in the oil industry are putting their efforts in the deve-

lopment of lubricating oils suitable to the engine of new technology. In our country, automobile vehicles use five lakh tonnes of lubricating oil every year. Till recently, we were using monograde motor oils in engines and they suit to a particular climate. The quality of these motor oils is determined by Bureau of Indian Standards (BIS) specification No. IS: 496 (1980). Depending on the viscosity, i.e. flow property of the oils they are classified in the Society of American Engineers (SAE) grades.

For example, a lubricating motor oil classified as SAE-20 possesses viscosity at 100 degree celsius between 5.6 and 9.3 centistroke units, whereas an SAE-50 oil has viscosity of 16.3 to 21.9 at the same temperature. There is another class of motor oils which are used during winter season and denoted by letter 'W'. Thus, the oil that is categorised as 'OW' can flow 35 degree below zero degree celsius and a '25W' oil can perform its lubricating activities at minus 10 degree celsius.

Of late, scientists have combined these two features and have deve-loped multigrade (MG) oils and they are now being marketed by different oil companies. An oil labelled as '20W40' should have viscosity in the range of 12.5 to 16.3 centistrokes at 100 degree celsius as per SAE classification and it must work in the cold weather of 15 degree below zero degree celsius. For an MG-Oil, lower the number at the left side of W, it works better in cold climate and higher the number toward right, it remains sufficiently thicker in hot weather to impart lubricity to machinery in an engine. The table on p. 123 can throw better light on dual function of MG-Oils:

Lubricants consists of a lubricant base oil, various chemicals that are added to provide the lubricant with specific performance properties and polymers which adjust the viscosity characteristics of the finished lubricants. There are pour point depresants (PPD) that do not allow oil to become solid at lower temperature; dispersants keep floating fine solid material like rust, dust & soot that enter the oil being used in a machine and avoid sludge formation that can result in retardation of speed of an engine. There are detergents for keeping machinery surface clean from soot and carbon particles, and anti-oxidant additives save oil from decomposition during lubricating process. When an oil in use, gets oxidised, acid formation results and there are chemical components in additives which are basic in nature and neutralise the acids formed to prevent further degradation of the oil.

Apart from these conventional additives, MG-Oils contain a special additive known as viscosity index (VI) improver, making them suitable for use in a wide range of temperatures, at higher speed and pressure while use in an automobile engines. MG-Oils not only reduce friction between two moving parts of engines but also help in conservation of fuels.

In addition, these energy saving oils last longer thereby conserving oil itself, and hence, need not require frequent change. When fuel burns in an engine, it leaves behind residue in the form of ash and its particles deposit on machine surface, becoming obstacle in speed. MG-Oils, because of their peculiar characteristics clean engine parts surfaces and reduce maintenance of a vehicle.

They, ultimately enhance life of an engine. In India, the motor oils being used now are mostly of American Petroleum Institute's (API) SF-classification but in America and Europe, API SG oils have been in use for last five years. Though API SF oils have good wear and oxidative stability, their deposit control is poor.

By developing another generation i.e. API SG oils, there is a major change in performance and that is better resistan to sludge formation in low temperatu and low speed applications. Efforts a made to manufacture SG-Oils wi indigenous base stock and chemical

Other varieties

Motor Spirit (MS) which is con monly known as gasoline or petrol an High Speed Diesel (HSD) are two maj fuels which are used for automoti vehicles. When crude oil is distilled a refinery to separate these fuels, pa of sulphur that is present in cru appears in these fractions, too. Dies contains comparatively more sulph than gasoline. When fuel is burnt engine this sulphur gets converted acid which can further deteriorate lu ricating oil.

As mentioned earlier, a lubricatin motor oil has to be ready with bas constituents to overcome this acid fo mation. High Total Base Numbe (TBN) lubricating oils are now avai able in market and used in buses trucks as they run on diesel.

Gears that control speed of an engin require gear oils for their smooth pe formance. They are, like motor oils als classified either as monogrades multigrades. When a vehicle is in spee gear parts slide on each other produc ing pressure and heat.

Gear oils, owing to extreme pressur (EP) additives in them can tolerate th tension and absorb the heat, thereb imparting smooth lubrication. EP add tives contain chemical compounds o elements like phosphorus and sulphu When a speedy vehicle is suddenl halted by applying break, gear parts ge hard-pressed against each other and hea is produced.

Here, the phosphorus compoun plays a vital role in dissipitation of th heat. On the other hand, when a vehi cle is moving toward high-levelled road its gears are under pressure and sulphu

containing compounds absorb this tension. Chlorine is another element whose certain compounds could also function as EP-additives but since it causes pollution, its use as additive has been restricted.

We know that cars, buses, trucks etc. run with 'four stroke engine' and two wheelers and rickshaws run on 'two stroke engine'. In case of a vehicle with four stroke engine, fuel and lubricating oil are filled separately but they are mixed together in a scooter or rickshaw tank. 2-T lubricating oils are available for these two stroke engine vehicles. Recently, a new version called 'Super 2T' oils have arrived in the market and because of their peculiar qualities, they are more advantageous for two wheelers. They protect the spark plug getting deposited with unburnt carbon residue which otherwise is a frequent trouble if any other oil is mixed with petrol.

Use of vegetable oils

There is a huge production of non-edible vegetable oils in our country. Seeds of neem, tamarind, mango, mahua, cocum, ambadi etc. give oil, containing certain health-hazardous constituent making them poisonous for human health. To face, the shortage of edible oil in the country, scientists had thought of making this oil useful for man by extracting out the poisonous fraction in it. Take an example of cotton seed. Its oil contains a pigment called gossipium which cattle alone can digest, and on removal of this pigment, the cotton seed oil has become suitable for human use. Before arrival of petroleum oils, vegetable oils were used for lubrication purpose. In today's oil crisis, scientists are, once again, thinking of using vegetable oils in the field of lubrication.

Of course, they have to overcome certain drawbacks of these vegetable oils as they contain double bonds in their chemical structures, and undergo fast degradation. Besides, they solidify very quickly and become useless in colder climate. However, scientists and technologists are moving forward to make certain modifications in their chemical nature before testing their performance. Double bonds that impart unsaturation to these oils' composition, could be removed by process of alkalination and esterification can stabilise acid-forming carboxyl groups of vegetable oils.

Similarly, chlorination and hydrogenation process also can help in removal of double bonds and chemical reduction of these oils can take care of acid groups making them prospective in the industry. If scientists in India are successful in above the exercise in their applied researches, our country has a great hope in overcoming oil crisis.

Table

Class of MG-Oil	Capacity of working in cold temperature (Border line pumping temperature °C)	Capacity of working in hot temperature (Kinematic viscosity at 100°C, Cst.)
0 W	- 35	—
5 W	- 30	—
10 W 30	- 25	9.3 to 12.5
15 W 40	- 20	12.3 to 16.3
20 W 50	- 15	16.3 to 21.9
25 W	- 10	—

NEW ENCILIUM YEAST BREWS MORE ALCOHOL

Grow some Encilium yeast on molasses, and it will continuously brew alcohol for several months, say researchers at the National Chemical Laboratory, Pune. NCL's Encilium process uses a novel strain of yeast which is retained in the reactor becuse of its characteristic physical properties.

It can be used for several months, while in the batch process currently in use, it has to be changed practically every day. The special flocculant Encilium strain, which increases fermentation efficiency to 90 per cent, is tailor-made for Indian molasses, claim NCL scientists. Encilium's unique feature is that it gets self-immobilised during its growth phase and can be separated from the fermented broth without the use of centrifuges.

Once grown in the fermenter, it converts molasses to ethanol continuously for several months, without any drop in the activity. No imported equipment or foreign know-how is required, and a much smaller fermentation plant that saves operating costs and leads to higher productivity suffices. Existing distilleries can also be modified to grow the new yeast strain.

In the new Encilium process, molasses is diluted with water, pasteurised by heating to 90°C, and cooled to 30°C. The molasses is then fed into a fermenter constantly supplied with air. The overflow from this fermenter, along with some additional molasses, is fed into a second fermenter and resulting broth is distilled to separate the alcohol.

NCL is willing to evaluate existing distilleries and recommend what modifications are needed for the Encilium process. It will provide the basic know-how for the fermentation process, growth of the yeast, as well as the yeast for start-up of the plant. It can also prepare the basic engineering package. The process has already been successfully commercialised by two plants.

P.T.I. Science Service
June 1-15, 1992, p. 1.

SURGICAL SUTURES FROM FISH INTESTINES

Indian scientists have perfected a technique to produce high-grade surgical sutures from fish intestines, an abundant raw material in the country. Strong, fine sutures as long as 1.5 metres can be produced from inland water fish guts, report scientists at the Central Institute of Fisheries Technology (CIFT), Kochi.

The sutures cause no local irritation or allergic reaction and can be easily absorbed, according to Dr. M.K. Mukundan, who headed the CIFT team. The government's green signal is awaited for using fish gut sutures in operations on humans in selected major hospitals, CIFT researchers told PTI. The new sutures may be especially suitable for producing ophthalmic grade sutures which are difficult to make due to non-availability of fine collagen filaments in nature.

The sutures have already undergone successful trials on guinea pigs at the Haffkine Institute, Bombay, where scientists operated the animals on their backs and implanted the sutures on incisions made on the skin. The Haffkine researchers closely observed the guinea pigs for any local allergic reaction, and later reopened the original cuts to see how well the new sutures were absorbed.

The tests show that the threads made of fish collagen fibres are completely absorbed within 15 days and do not cause any allergy or irritation. Treating the collagen fibres with dicarbonyl chemicals gives stronger sutures, the CIFT scientists say. Absorbable sutures are essential for wound healing after surgery. Carbolised "catgut" fibres are the most popular, although others like linen strips, leather and horse hair have also been tried. In the CIFT technology, the fish intestines are squeezed empty and washed with water and dilute salt solutions.

They are then suspended for a few hours in a "pickling" solution containing sulphuric acid, sodium chloride and chromium salts to remove all soluble proteins and get pure collagen fibres. The collagen fibres are further strengthened by cross-linking with diacetyl, and coated with chemical solutions to give surgical threads that can be packed in air-tight polyethene bags in a medium containing 92 per cent isopropyl alcohol.

P.T.I. Science Service
June 1-15, 1992, p. 2.

PROCESS TECHNOLOGY FOR COCONUT CREAM

Scientists at the Regional Research Laboratory in Thiruvananthapuram have developed a process technology for the production of coconut cream, a value-added product from fresh coconuts. The coconut cream could serve as substitute for fresh coconuts in places where fresh nuts are not readily available.

The composition of the canned cream is 23 per cent fat, 45 per cent protein, 5.5 per cent carbohydrate, and 1.5 per cent minerals. The cream developed by RRL technology is said to have a natural coconut flavour. In the optimised process, well ripened fresh nuts are dehusked and aged for a week. After splitting they are deshelled and the kernels are immersed in hot water for blanching.

Subsequent to blanching the kernel size is reduced to gratings using a hammer mill which facilitates easy milk extraction. A screw press has been specially designed and fabricated for this purpose which has high efficiency for the extraction. Additives are dispersed in the filtered milk before the milk is emulsified. In the emulsification process intimate mixing of the additives with the milk, uniform dispersion and size reduction of the fat globules take place to give the creamy consistency.

After pasteurisation, the cream is canned and subjected to exhausting, sealing and retorting techniques. This canned cream is ready for use. The RRL which set up a demonstration plant at Cochin with a processing capacity of 1,000 nuts per batch has released the technology to two private entrepreneurs for commercial production with capacities of 10,000 nuts per batch.

The cost of the plant and machinery is Rs. 7.5 million. Test-marketing of the cream in Bombay, Delhi, and Madras, has indicated that it is acceptable in households and in hotels, according to an RRL newsletter.

P.T.I. Science Service
June 1-15, 1992, p. 2.

SCIENTISTS DEVISE SEX-BAIT TO KILL CROP-RAVAGING BEETLES

Scientists in Thiruvananthapuram in Kerala have devised a sexual bait to capture and kill beetle-like creatures that have for decades been eating away sweet potato crop in India. Production of sweet potato has more than doubled in farms where the bait was used in field trials, according to scientists at the Regional Research Laboratory (RRL) who synthesised a vital chemical used in the bait.

The chemical is a synthetic version of a sex pheromone secreted by the females of the sweet potato weevil beetle. This pheromone attracts male weevils into the trap where they are killed with a detergent. Continuous elimination of the male weevils leads to drastic fall in the overall weevil population, and a significant reduction in crop damage, says Dr. A.D. Damodaran, RRL Director.

Weevil beetles infest between 10 and 55 per cent of sweet potato crop cultivated over 16,000 hectares across India. RRL scientists say conventional pesticides have not worked too well because of their low efficiency.

Scientists hope to use the synthetic pheromone baits to boost sweet potato production in India from the present yield of 8 tonnes per hectare which is way below the average world yield.

The synthetic pheromone, Z-3-dodeconol-E-2-butenoate, remains active right from the planting to the harvesting period, say scientists at the Central Tuber Crops Research Institute (CTCRI), Tiruvananthapuram, who conducted field trials.

This is the least expensive technique of controlling the sweet potato weevil population, CTCRI scientists, K.S. Pillai, M.S. Palaniswami, and T. Premkumar, said in a report on their trials with the synthetic pheromone.

Farmers have been a little reluctant to use the few conventional pesticides effective against the sweet potato weevil because of their prohibitive cost, the CTCRI scientists said.

Large-scale trials of the pheromone baits on farms are now in progress. RRL scientists say there are good prospects of exporting the synthetic pheromone to other countries where sweet potato crop is ravaged by the weevils. Field trials at the CTCRI farm showed that the use of the pheromone baits reduced weevil infestation of sweet potato crop from about 47 per cent before use of the bait to 8 per cent after the traps were set. The mean weevil population per tuber in the untreated crops was 12 while it was less than one in the sweet potato crops where the pheromone baits were laid out, the CTCRI scientists said.

The scientists have reported that in farms where the pheromone baits were used in trials, the marketable tuber yield ranged from 25 to 30 tonnes per hectare, nearly thrice the average Indian yield. RRL scientists have also synthesised a pheromone of another insect, the cardamom shoot borer, which is a major pest of cardamom, ginger and turmeric. Field trials of this pheromone are now under way.

P.T.I. Science Service
June 1-15, 1992, p. 3.

DIRECT SOMATIC EMBRYOGENESIS IN PEANUT

Raising peanut plants through tissue culture can be over in less than a month, thanks to a simple and fast method devised by the National Chemical Laboratory (NCL), Pune. NCL has, for the first time, successfully optimised the process for raising peanut plantlets from somatic embryos, without an intermediate callus stage, in 20 to 30 days.

Elimination of the callus stage leads to clones with greater genetic and cytological uniformity. The somatic embryos in the NCL method arose from immature zygotic (sexually produced) embryos that were 3-6 mm long. The complete process of development of somatic embryos from the initial globular stage to a fully mature embryo, is over in one step in 20 days.

The plants obtained from the somatic embryos were morphologically uniform, NCL scientists S. Hazra, S.S. Sathaye and A.F. Mascarenhas have reported. The first and second generation seeds were also uniform. The seeds from the second generation plants will be tried in the field and screened for oil and protein content, say NCL researchers. Preliminary experiments suggest that, like natural seeds, the somatic embryos too accumulate storage lipids.

This indirectly suggests that the enzymes responsible for lipid synthesis are also active in somatic embryos, which can possbily be manipulated *in vitro* to understand the metabolism of storage lipids. However, the limitation of the NCL protocol is that the immature zygotic embryos can be obtained only during the peanut growing season. To overcome this problem, the NCL scientists have successfully optimised a process to regenerate peanut plants from immature leaf explants. Plants regenerated *in vitro* from either immature zygotic embryos or leaf tissues have been grown to maturity in the greenhouse and the seeds are being tested. The *in vitro* studies on peanut are aimed at improving the yield of the protein-rich oilseed crop, whose production of 800 kg per hectare is far below levels of 5,000 kg per hectare in Israel, 3,500 in Malaysia and 3,000 in the United States.

P.T.I. Science Service
June 1-15, 1992, p. 4.

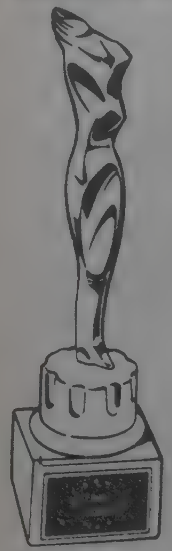
INDIGENOUS ROXYTHROMYCIN TO HIT MARKET

Roxythromycin, an effective antibiotic against several respiratory, skin and genito-urinary infections, is to be produced indigenously and introduced in the Indian market by a Baroda-based pharmaceutical company. The technology for the medicine had been developed by the company indigenously from the very basic state. The company is certified by the Union Ministry of Science and Technology for it.

The firm is exporting the antibiotic to Mexico and Spain and competing against a multinational company which alone had the monopoly of the drug till recently. The British Journal of Clinical Practice reports that roxythromycin is 100% effective against a typical pneumonia, acute bronchitis and genito-urinary infections such as urithritis, salpingitis and lervictis. It is more than 70% effective in pneumonia and chronic bronchitis.

The journal also reports that the antibiotic is 100% successful against pharyngitis, tonsilitis and sinusitis. Doctors at the Madras Medical College said roxythromycin was introduced abroad since late eighties, but is a new entrant in India. They said the antibiotic could be used effectively against both gram positive and gram-negative bacteria. The antibiotic is bactericidal even in low doses unlike erythromycin.

P.T.I. Science Service
June 1-15, 1992, p. 4.



New Products

FRP COOLING TOWERS FROM AVON

Avon FRP cooling towers use state-of-the-art technology currently being used in advanced countries. They are sturdy, corrosion proof, and aesthetically designed. Due to their stationary water distribution arrangement, they provide high performance at minimum maintenance cost. Some of their salient features are:

Wide Range: Avon offers packaged cooling towers of capacity ranging from 5 tons to 150 tons.

Latest Design: Avon cooling towers use the latest international design. They have vertical induced draft counterflow with solid pattern uniform water distribution and optimal heat transfer.

Sturdy Casing: Avon tower casing is made of strong Fibreglass Reinforced Plastic (F.R.P.). It has vertical corrugated design for additional support to the motor & fan, extra structural strength and aesthetic appeal. The portion of casing housing fill and eliminator has a square cross section.

Though the casing is a one piece moulded construction, it can also be supplied in C.K.D. & S.K.D. (Complete & Semi Knock Down) condition for easy installation and for export purposes.

Efficient, Trouuble-free water Distribution

Avon's world-class fixed sprinkler does what most rotating sprinklers fail to do: efficient distribution of water with almost zero maintenance. Its corrosion-free all plastic polypropylene header pipe and specialised low pressure drop nozzles are completely solid without any moving parts. As a result bearing failures, rotational jamming, solidified grease particle interference and other operational or maintenance problems do not arise.

High Efficiency Fill

Avon's U.V. stabilized PVC fill is of honeycomb design with very large contact surface area. As a result the time for contact and heat transfer between water and air is increased greatly. The air pressure drop through the fill is negligible.

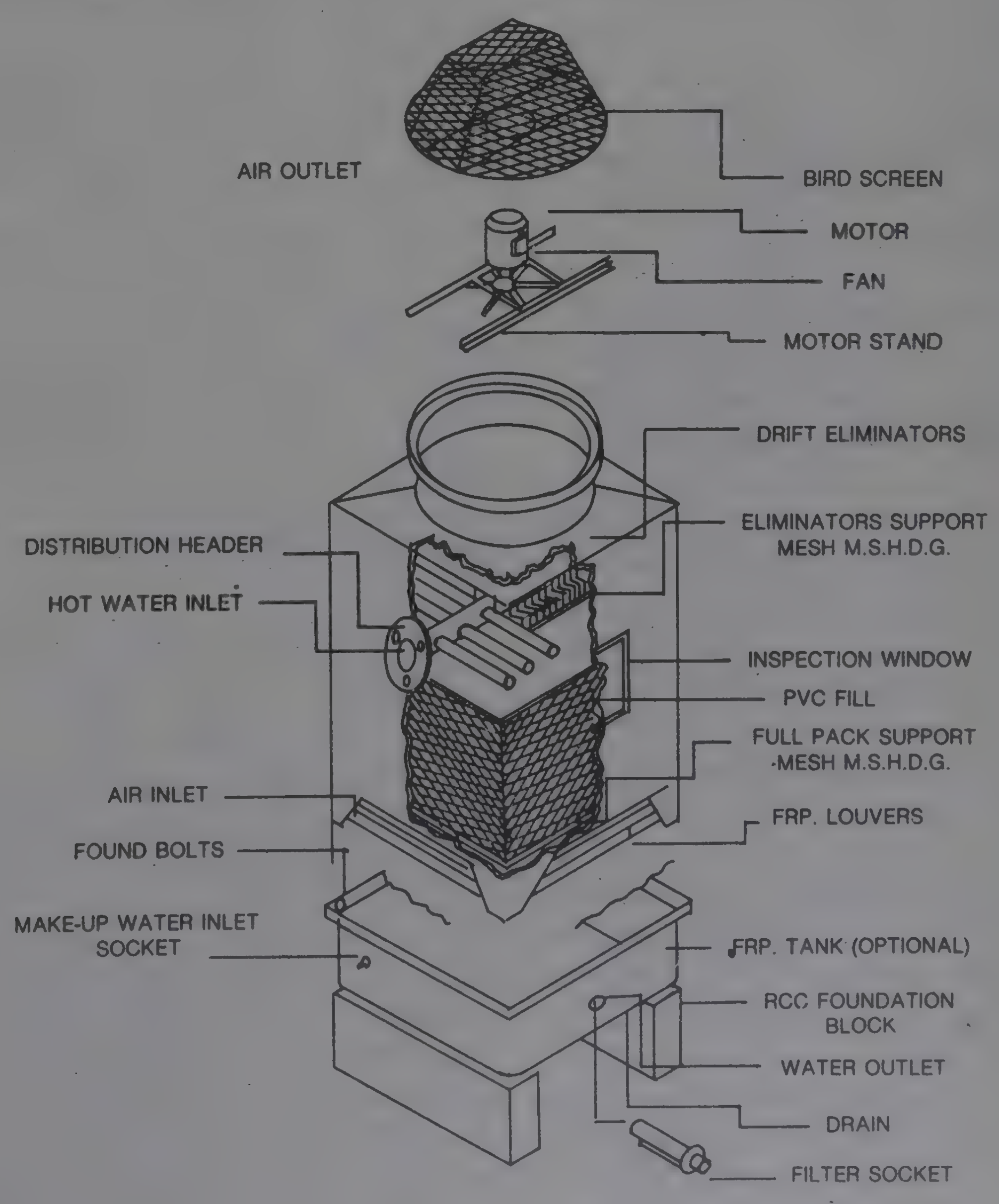
Eliminator: The eliminator is of rigid PVC and is of fixed type having small water carry over losses.

Fan: The fan is directly driven and is axial flow type. Its blades are of cast aluminium. The fan is statically and dynamically balanced.

Fan Motor: The fan motor is of totally enclosed type, as per IP 55 and suitable for outdoor mounting. Bird screen is also provided.

Inspection window: An inspection window is provided for observation and for access to the inside of the cooling tower without removal of fan. It can also be used for routine inspection.

Corrosion Free: The tower casing is of FRP, fill and eliminator are of PVC, and also the header sprinkler is of polypropylene thus eliminating complete corrosion, the biggest enemy of cooling towers. Hardware & motor support etc. are of stainless steel and hot dip galvanized steel. As a result, Avon cooling towers are absolutely corrosion free.



Cross-section of Avon FRP cooling tower

Light Weight: The towers are compact and light weight and therefore, easy to instal. Light weight also saves on structurals and masonry. Roof installation can also be done without any special reinforcement.

Easy to Install: Since Avon towers are completely factory assembled before despatch, installation is easy. At site the tower has just to be bolted on the RCC/brick masonry tank or tower with optional F.R.P. tank has to be placed on foundation, thus saving a lot of installation time/labour. Towers of higher capacity C.K.D. & S.K.D. (Complete & Semi Knock down) type can easily be assembled at site and then installed in a manner similar to small towers.

For further details contact: Avon Cooling Towers, 12, K.C. Indl. Estate, 2nd floor, Subhash Road, Jogeshwari (E), Bombay 400 060. Tel.: 6341036/6372804/6379703.

COLLAPSIBLE PLASTIC STORAGE TANKS FOR STORING DIFFICULT LIQUIDS AS WELL AS WATER AND GAS

Industrial Silicones, Madras have offered membrane plastic storage tanks using nylon reinforced plastics or plastic coated — low head types from (W) 1 m x (L) 2 x (H) x o.5 m (2/3m^3 capacity) size to (W)2M x (L) 5M x 1/2 M (5m^3 cap.) To store corrossive and difficult liquids as well as gases etc. The tank come with inlet and outlet valves. They cost half the price of plastic tanks and one fourth that of fibre tanks. Different materials to suit different liquids, temperature etc. can be offered.

For further details please contact: Industrial Silicones , 133, Poonamallee High Road, Maduravayal P.O., Madras 602 102.

PLATFORM WEIGHT TRANSDUCER

Technolab Platform Transducer come in various platform sizes upto 3 X 3M and capacity upto 10 tons. They use 4 numbers of shear beam load cells and as such are rugged and accurate. The remote microprocessor based digital indicator has push button tare or key board entry for tare weight. A printer can be added if desired. They are ideal for use as industrial scales, tank scales, wheel weighers etc. The company also offers consultancy on the use of load cells and computers to solve industrial weighing problems such as tank weighing.

For further details contact: Technolab Innovex Limited., No. 133 P.H. Road, Maduravayal, Madras 602 102. Phone: 428773.

FLEXIBLE GAS TANKS

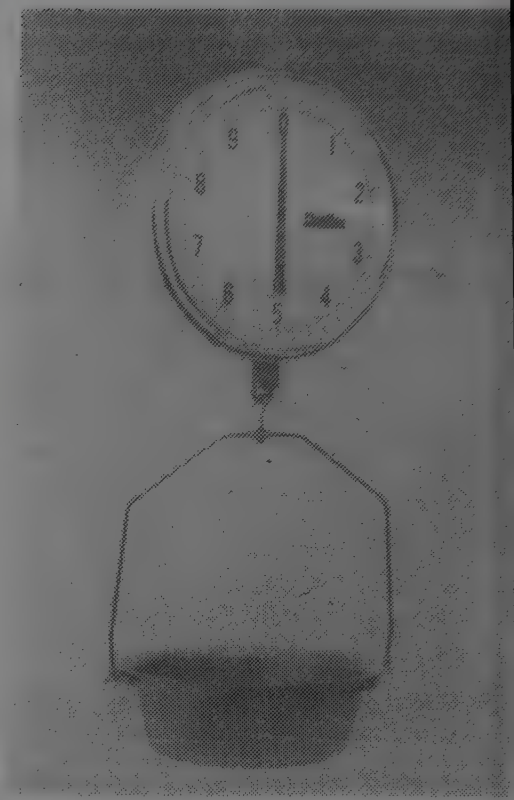
Technolab Plastic Membrane flexible bags can hold any type of gas including oxygen, nitrogen, natural gas, carbon-di-oxide for such use as sampling, purging, lab use etc. Positive pressure is created by adjustable weights. They are available from 1m^{3}capacity to 10m^3 capacities complete with valves and connection tubes.

For further details please contact: Technolab Instruments (Madras), 18/1A, P.M. Road, Maduravayal, Madras 602 102. Phone: 428773.

HANGING WEIGHING SCALE

Chatillon USA now offer economical general purpose hanging scales that are reliable and accurate. These popular scales are used widely for weighing a wide varirty of commodities. Their robust construction offers long life with a minimum of maintenance.

Chatillon Hanging Scales feature 13 inch/9 inch/7 inch diameter glass covered dials. They are available with a single dial reading clockwise or with double dials (one dial reads clockwise, and the opposite dial reads counter clockwise), and are provided chrome plated steel outer band and glass retaining sashes.



Hanging weighing scale

All models feature machined stainles steel pinions. Full capacity is reached i two/three pointer revolutions dependin upon dial size. Runners are indexed fo each revolution. Zero adjust screw ma be used to zero out additional tares upt 10% of dial reading. These scales main tain their accuracies between -10°C t +40°C. Various loading attachment such as hook only, round stainless stee pan, galvanized steel scope or galvanised steel square pan are available Capacity range available in 6 kg, 15 kg 20 kg and 30 kg version.

For further details please contact: Multiflo Instruments Pvt. Ltd., W-30, MIDC Industrial Area, Phase II, Manpada Road, Dombivli (E) 421 204, Dist. Thane, Maharashtra.

PEN-TYPE COATING THICKNESS GAUGE

CMI International USA now offers Model "POSIPEN" a hand-held pen-type coating thickness gauge. Model "POSIPEN" can be placed with pin-point accuracy on any location of the part to be measured. It also measures on hot surfaces, on small surfaces, in different positions — horizontal, up or down. "POSIPEN" has the smallest

unique magnet of any coating thickness gauge and therefore can measure on extremely small parts, on peaks and in valleys.

Each "POSIPEN" is calibrated to NIST calibration standards. The Scale can be in Mils or microns, Range is 5 to 500 Microns and Accuracy $\pm$ 10%. The gauge is manufactured in two versions "POSIPEN A" for Normal temperature and "POSIPEN B" for extreme temperatures (100°C to + 230°C). "POSIPEN" measures Non-magnetic coating such as paint, enamel, plating, hot-dip galvanizing on steel.

For further details please contact: Multiflo Instruments Pvt. Ltd., W-30, MIDC, Phase II, Dombivli East 421 204, dist. Thane, Maharashtra.

BELT CONVEYOR

Belt conveyors have attained a dominant position in Bulk Material Handling due to such inherent advantages as their economy and safety of operation, reliability, versatility and practically unlimited range of capacities. In addition, they are suitable for performing numerous processing functions in connection with their normal purpose of providing a continuous flow of material between operations.

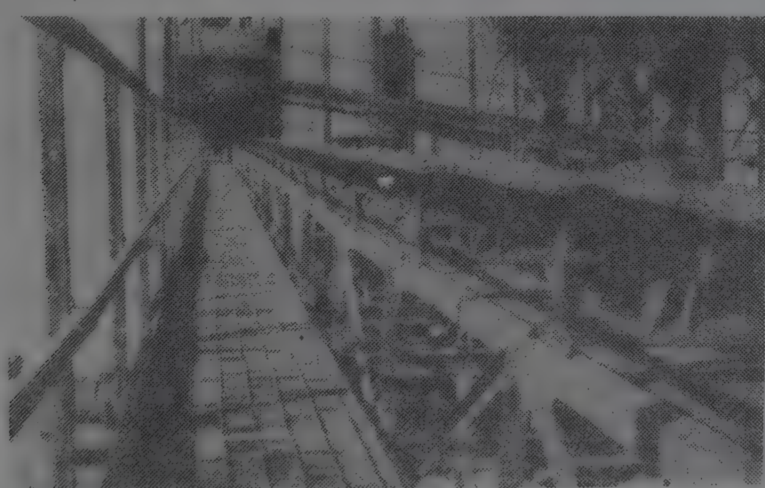
Indiana has designed, manufactured, supplied and installed a large number of Belt conveyors in various sizes, capacities and configurations. They manufacture all the mechanical components thus ensuring that the assembly conforms to high standards of engineering and quality.

Idlers: Idlers greatly influence belt tensions, power requirement belt life, capacity and operational success of a connveyor.

Based on experience, Indiana offers various roller designs ranging from a small light duty design for seasonal or intermittent service to a heavy duty unit for continuous handling of heavy coarse materials.

Pulley assemblies: Indiana pulleys are of heavy duty construction suitable for continuous operation. Minimum pulley diameters are as per IS: 1891 (Part I)-1978 while other dimensions and tolerances are as per IS:8531-1977.

Various types of supporting structures are offered starting from a simple stringer with short supports to the most complex convey or gallery with walkway on both sides and asbestos sheet cladding. All structures are carefully designed for high strength to weight ratio as also for minimum deflection and vibrations.



Standard drive unit consist of a TEFC squirrel cage motor coupled to a worm type gear reducer through flexible coupling. Other variationns like helical/ shaft mounted reducers, fluid/geared couplings can be supplied. Wherever required by client, electrical safety devices like pull chord switches, Belt sway switches and Zero speed monitors can be supplied.

Standard belt widths are 400 mm, 500mm, 650mm, 800mm, 1000mm, 1200mm, 1400mm and 1600 mm as per IS 4776 (Part I)-1977. However intermediate or higher widths can also be supplied.

For further details please contact: M/s. Indiana Engg. Works (Bombay) Pvt. Ltd., P.B. No. 7409, Andheri (E), Bombay 400 059. Phone: 6344743/ 6349857; Telex: 011-75208 IEW IN/ 011-76301 NTEK IN; Fax: 22-6367154.

USED AUTOMOTIVE CATALYSTS EMPLOYED FOR THE PRODUCTION OF NEW ONES

In the "Degussa-Kat-Verbund" (Degussa catalyst cooperation), five German companies are responsible for the recycling of used exhaust catalysts.

Protecting the environment, avoiding waste, recycling secondary raw materials and preserving resources are irrefutable demands of our time. Recycling used catalytic converters is a particularly worthwhile undertaking, due to their valuable platinum and rhodium content.

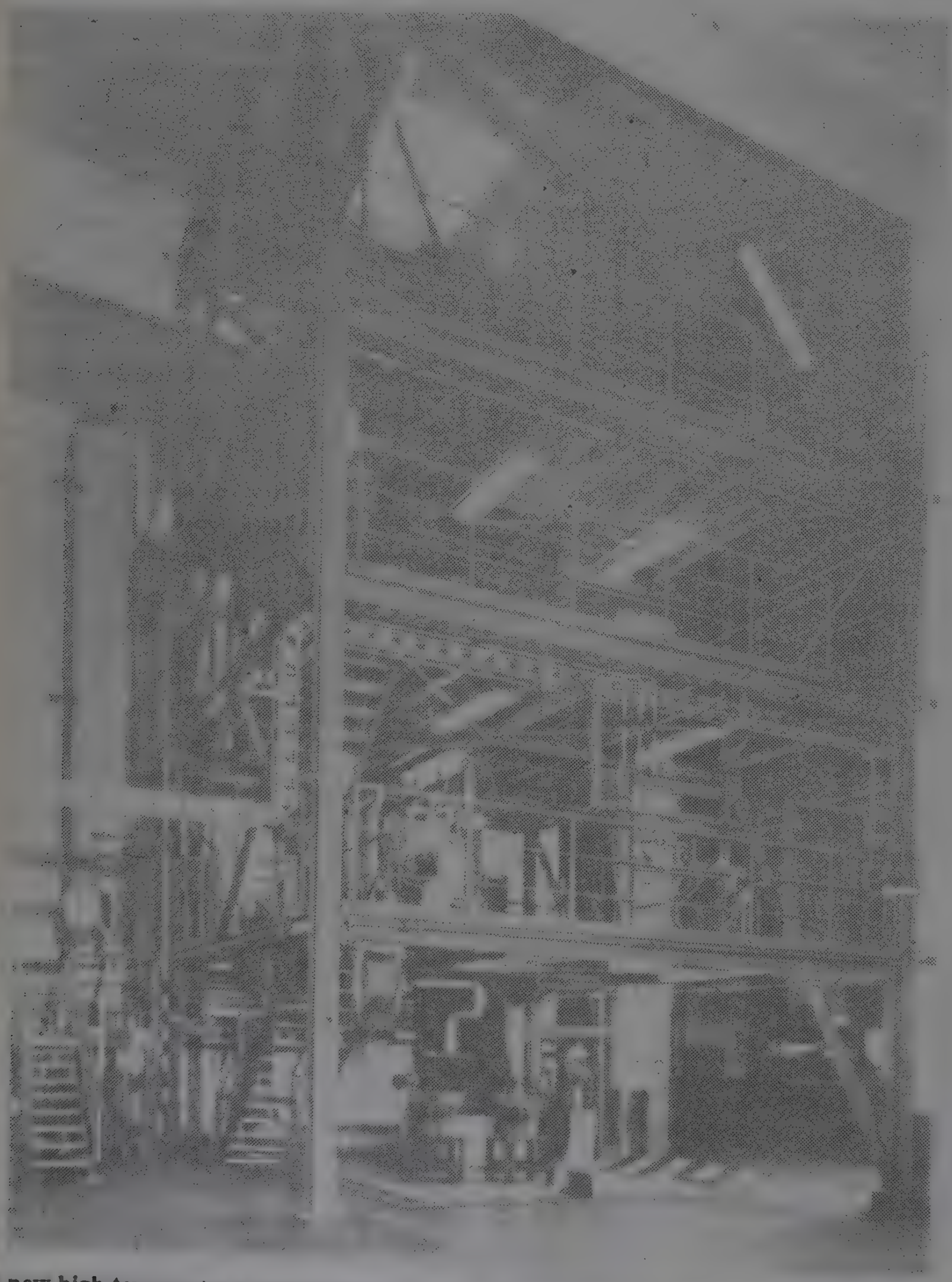
The following companies have therefore, joined to create a technically and logistically effective system for recycling used catalytic converters: the Hanau-based Precious Metals Refining Business Area of the Frankfurt company Degussa AG, DEUMU Deutsche Erz-und Metallunion GmbH, Hanover (a subsidiary of Preussag AG), MG Metall und Recycling GmbH, Frankfurt am Main (a subsidiary of Metallgesellschaft AG), C.H. Scholz KG of Essongen, near Aalen and Zimmer Schrott-und Metallhandels GmbH of Hurth. Their objective is to accept as many used catalytic converters in the future

as possible, the number of which will continue to increase, and to recover the highest possible proportion of the precious metals they contain. The stainless steel casing will be returned to the materials cycle as a secondary raw material.

The number of used catalysts is increasing

In 1991, catalytic converters were installed in 10 million vehicles in Europe alone. By 1994 this number will have increased to 20 million. By the end of 1991, over 10 million vehicles in Western Germany were fitted with catalysts containing around 14,000 kg of platinum and 2,800 kg. of rhodium, these materials having a total value of around 650 million German marks. In five to ten years time, these catalysts will have reached the end of their useful life and will be scrapped.

In 1991, some 200,000 used catalysts were recycled in Europe; it is estimated that 1 million will be reycled in 1995 and at least 8 million in the year 2000. The logistic system adopted by those participating in the Degussa-Kat-Verbund for recovering and recycling used catalytic converters will be co[ncentrated] on Germany in the init[ial] period, but the plan is to extend the pr[oject] to cover the whole of Europe.



The new high-temperature electric furnace at the Hanau metal works of the Frankfurt-based Degussa AG is specially designed to recover a high proportion of precious metal when recycling used exhaust catalysts from automobiles.

Five companies with specific know-how

As legally independent compani[es] operating autonomously in the interes[t] of an effective and coordinated divisio[n] of labour, the participating partners i[n] the Degussa-Kat-Verbund each contrib[ute] their technical expertise and specifi[c] know-how to the group project.

Degussa AG, the company initiatin[g] the project has over 150 years of exper[ience] in the recycling of preciou[s] metals. At its Wolfgang metal works i[n] Hanau, the largest refining plant in con[tinental] Europe, Degussa recently bega[n] to operate a high-temperature electric furnace which is specially designed to optimize the process of recycling used catalysts and to guarantee a high precious-metal recovery rate. Moreover Degussa is itself one of the world's leading manufacturers of automotive exhaust catalysts with production sites in Germany, Canada, USA, Brazil, South Africa, South Korea and Japan. Current capacity of 17 million units per year is to be increased to 22 million units by 1994. In this way precious metals obtained from recycling catalysts can be channeled back into the production cycle.

The project benefits from DEUMU's experience in the fields of ferrous and non-ferrous scrap metal processing. Its areas of activity include the systematic dismantling of scrapped vehicles --work carried out as part of the pioneering PRAVDA project (the German automobile industry's project for recycling scrapped vehicles). Together with medium-sized companies and the automobile industry the plan is to build up a national network of car dismantling centres. A comprehensive workship waste disposal system is also to be established in north Germany. Syner-

gies will develop as a result of close links with other Preussag subsidiaries concerned with recycling waste substances.

The MG Metall und Recycling GmbH is currently constructing an automatic plant in Frankfurt for dismantling used catalytic converters and preparing their ceramic monoliths for supply to Degussa. When collecting up old catalytic converters this company, a leading supplier of scrap from batteries to lead manufacturers, is to a large extent able to make use of its long-established logistic systems for collecting scrapped batteries, since batteries and catalytic converters are usually scrapped in the same places.

The medium-sized family business C.H. Scholz KG is one of the most significant scrap disposal companies in Germany, with an average monthly ferrous scrap turnover of 120,000 tonnes. The German State of Baden-Wuerttemberg is the main center of its activities. The Scholz Group also has a significant share in the former scrap metal combines Metall Rohstoffe in Thuringia and Metallaufbereitung of Zwickau in Saxony. In the initial phase, Scholz is to concentrate its efforts to collect used catalytic converters on these three German states. Since 1988 the Zimmer Schrott-und Metallhandels GmbH has been involved in collecting and recycling used catalytic converters obtained from car manufacturers and importers, workshops and authorized dealers, car recyclcers and scrap and metal dealers throughout the whole of Germany. This is done on a supra-regional basis in cooperation with metal dealers, using the company's own collection vehicles in the Cologne area in addition to rail freight.

Five grammes of platinum can be recovered from about three kilogrammes of used catalytic converter and used for the catalytic coating of new converters. In order to organize the process of recycling precious metals effectively from used catalytic converters, including the extremely valuable metal rhodium, the following companies have joined together to form the Degussa catalyst scheme: Degussa AG, DEUMU Deutsche Erz und Metall-Union GmbH, MG Metall und Recycling GmbH, C.H. Scholz KG and Zimmer Schrott- und Metallhandels GmbH.

When removing spent catalytic converters, the Hurth-based company Zimmer Schrott und Metallhandelsgesellschaft mbH uses guillotine shears to cut up the catalytic converter shell.

For further details contact: Degussa AG, Public Relations Department, Postfach 110533, D-6000, Frankfurt-11, Frankfurt am Main, Germany.

POWDER COATINGS REMOVER

Stripzol EPR is a non-flammable solvent based stripper widely used for instant removal of powder coatings. Powder coated articles that are rejected are simply immersed in Stripzol EPR for 2 to 10 minutes and the coating gets completely blistered or separated from the metal surface without attacking or damaging the base metal.

Stripzol EPR is to be used as supplied without dilution at room temperature in a metal tank or container. Stripzol EPR is available in two standard packings of 6 kgs and 35 kgs.

For further details contact: Ashok Industry, 101, Kakad Chambers, 132, Dr. Annie Besant Road, Worli, Bombay 400 018. Phone: 4835896/4934515.

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Plastics Waste: Problems and Solutions

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Introduction

There is global concern about solid wastes. The plastics and packaging industry are considered guilty for the growing heap of solid wastes. The option of avoiding the use of plastics is not likely because a majority of conventional materials like metal, paper, steel are being replaced by plascitcs. Table 1 shows percentage of plastics materials used in different areas. Of the material that end up at the landfill, plastics account for 7% by weight, paper products account for 35% by weight and metals and glass for 8% each.

Table 1

Percentage of Plastics Materials used in Different Areas

Material At Landfill sites	% of Total
1. Food & Yard Waste	31
2. Nondurables	25
3. Durables	14
4. Packaging	30
Total	**100**

The plastics manufacturing industry is concentrating intensely on the task of managing the total plastics waste arising from its activities and seeking to do so without any additional burden on environmental resources. In the USA, 75 per cent of solid waste is sent to the landfill, with an additional 14 per cent incinerated and 13 per cent recycled. This is quite different from Western Europe and Japan where 30 and 70 per cent of the solid waste is incinerated and 50 and 2(per cent respectively is sent to the landfill. This forms the first of the problems, viz. we are running out of landfill space. As the old ones fill up, they are being closed. New sites are not being opened as fast as closures due to lack of space and citizen pressure. Within the next 5 years, landfill sites/space will decrease by approximately 12 per cent, while per capita garbage disposal would increase to 20 per cent if unchecked. For example, in the USA the current estimate is that polymer waste represents 7.3 per cent by weight but 16.3 per cent by value. By year 2000, the volume of waste occupied by plastics is predicted to grow to 31.4 per cent. While incineration is a practical and viable solution, it falls into the same category as new landfill sites — nobody wants it where they live. Another problem is that many people simply throw things away the very second they are finished using them, whether in the beach or out of the car. While paper, food and many other products will disappear into the countryside, plastics will not, since they do not degrade. As a result, there is a steady buildup of plastic bottles, film, untensils, foam packaging, etc., that has caused rightful concern and has led to legislated response. Thus, the real basis of the problem is two fold — solid waste disposal and litter with plastics. There is a third basis for concern as well viz. resource conservation. Some people are taking a long term outlook that when something is burned or discarded it contributes to a slow but steady depletion of the earth's resources. They think, it is better to use renewable resources or re-use and recycle materials rather than discard them after being used only once. Since plastics can be effectively recycled a successful recycling programme will fulfill their concern.

Plastics are thought to be the major constituent of solid waste. The very things that have promoted their wide use, viz. the ability to be used in both durable and non-durable applications are now becoming detrimental factors. Table 2 shows that the volume of plastic in waste stream is 18%. Table 3 indicates a typical analysis of plastics content in house-hold waste.

Table 2

Components of Solid Waste by Volume

1. Paper and Cardboard	38 %
2. Plastics	18 %
3. Metals	14 %
4. Yard Waste	11 %
5. Food Waste	4 %
6. Glass	2 %
7. Other	13 %

Table 3

Typical Analysis of Plastics Contents in Household Waste

Type of Polymer	Percentage
Polyethylene	47
Polypropylene	16
Polystyrene	16
Polyvinyl chloride	6.5
PET	5
Polyurethane	5
Other plastics	4.5

The filling of municipal landfill is not always carried responsibly. Significant amounts of used packaging materials

are dumped in inappropriate places with little or no regard for the resulting damage caused to the environment. A large amount of plastic that is thrown away each year is either dumped into the sea or eventually finds its way there. For example, in 1982 an estimate was made of the amount of plastic rubbish dumped by the world's shipping industry. The study concluded that 639,000 plastics items in the form of bottles, shopping bags, cups, plates, rings for holding beer cans together, and dustbin sacks are among the articles regularly dumped.

The effect on marine life of such widespread pollution by polymers in significant. Sea turtles, for example, may mistake plastic pellets for food. Having consumed these pellets, the turtles becomes too buoyant to dive for proper food and consequently die. Sea birds, too, mistake plastic pellets for food, also with fatal results, as the indigestible polymer clogs their intestines.

Viable Solutions

The current emphasis on recycling is born of a pragmatism that is not necessarily a cosy way out. The use of disposal materials carries with it not only problems of waste but also of recycling and reuse. Issues range from recycling virgin production scrap to disposing of contaminated medical wastes. Some of the options that need consideration are as follows.

(1) Reduce the amount of plastics in the waste stream (source reduction). This can be accomplished by a number of methods:

* Reduce the weight/thickness of plastic products.
* Redesign packages to eliminate non-functional extra layers.
* Introduce refillable containers using concentrates in pouches.

(2) Re-use plastics more than once. For example grocery carry-out bags can be used on more than one occasion. This is already being done in many parts of Europe where a small charge may exist for each new bag used or a 'Reward' exists for returning a used bag. People will bring back the bag for re-use under this scenario.

(3) Recovery, whether through waste-to-energy incineration or chemical/refinery recovery, is the best solution as it fully recaptures the high energy and fuel value of plastics, eliminates the need to recycle and reduces the volume of other waste stream going to the landfill.

(4) Recycle. While not as good as the recovery optain, it may be the only option in some cases. Recycling is a universally accepted solution recognised by essentially every environmental, consumer and legislative groups.

Recycling is difficult and costly because of the needs t

(a) Separate diverse materials and ensure purity of th desired end-product.

(b) Compensate for degradation from aging of the recycle product and the stresses for recycling.

(c) Find good value-added end-uses, and

(d) Invest in capital equipment, with its ensuring high energ costs.

However, recycling can yield profitable materials and end products with predictable properties and end-uses.

(5) Repolymerise. There are two processes that have been developed for PET methanolysis and glycolysis. Both processes have received US Food and Drug Administration (FDA) approval, premitting food contact use. The process involves depolymerising the PET, and then repolymerising it from the constituent material.

(6) Refute. To change tarnished image of plastics, it requires a long educational campaign that goes well beyond advertising. Factual information must be coined with demonstrated success in source reduction, recovery and/or recycling. The educational programme must be all-encompassing targeting children, adults, educators, legislatore, etc.

(7) Biodegradation was once promoted as a viable process that reduce the volume of plastics in the landfill. It was soon realised that nothing degrades in a landfill (organic, inorganic or otherwise), since the necessary conditions of air, water, pH, bacteria, etc. do not exist within the landfill. Unfortunately, the promotion of plastics as being biodegradable with the subsequent public realization that it really doesn't biodegrade has done more harm than good. In addition, there are two other important points on biodegradability. The first is that when biodegradable additives are incorporated into the polymer, the polymer itself doesn't degrade; the additive degrades resulting in small particles of polymer. The second is that the incorporation of these additives interferes with recycling as it causes, instability in the recycled product and reduces the performance of the orginal article; for e.g. often requiring thicker films.

(8) Photodegradation. This process is slow and requires lengthy exposure to sunlight. Waste at a landfill is rapidly covered not leaving enough time for photodegradation to take place.

The plastics industry must develop and support a clear, unified programme to change public opinion (education) and alleviate the solid waste problem.

Paper is by far the most discarded material, accounting for two-third of the estimated 140 million tons of annual waste;

Table 4

Recyling of Materials

Material	Fraction Recovered (%)
Paper	30
Plastics	01
Resins and Fibres (Manufacturing Waste)	75
PET bottles	20

plastic waste accounts for less than 10%. Paper is also the most recycled material (Table 4). The amount of plastic production recycled is small, about 1%. However, the recovery of resin and fiber from waste generated during manufacture of plastics is high because the waste is uncontaminated, not degraded, and easily collected. The leading instance of plastic recycling is the more than 100 million pounds recovered from the conversion of polyethylene terephthalate soft drink bottles into fiber. Polyethylene bottles are also converted into plastics lumber and traffic cones.

Designing disposable materials poses great technological challenges — not the least of which is to develop fibres and films with stable processing and service lives that will not degrade in use, but rather will self-destruct in months or years to become products that gratefully and non-threateningly enter the ecological chain. Progress has been made in this direction which requires unorthodox thinking and great caution. Today's harmless degradation products may be tomorrow's toxins. Innocuous decomposition products may become implicated in the greenhouse effect or the reduction of the atmospheric ozone layer!

Origin of the Plastics Waste

Generation of plastic wastes can be from:

(a) Recovery from household waste
(b) Recovery from horticulture and agriculture plastic wastes
(c) Recovery from various distributive wastes
(d) Plastic waste from the automotive industry
(e) Plastic waste from other sources such as canteens, airports, restaurants, which use considerable amount of disposable plastic.

Waste also arises at the production, at the processing and at the consumption stages, even if it is to different extents. At the stage of the plastics production and the plastics processing the amount of waste arising is compartively small. The quality of waste treatment is already rather extensive so that the remaining waste is comparatively small (about 150,000 tons per year = about 4% of the total production). The waste ratio is greater with big end-processers as for instance agricultural enterprises, airlines, large-scale kitchens, hospitals etc. where waste treatment is not yet well-known. The largest share of the plastics waste is to be found in the domestic waste (about 1,000,000 tons per year) but it accounts only for 5% of the total waste ratio.

As long as overall waste recycling plants do not exist the treatment of plastics waste will have to be limited.

Recycling of Plastics Waste

Any recycling of waste must particularly be followed by reprocessing. This is all the more difficult as the waste is built up more complicatedly.

There are four types of recycling:

Primary Recycling

Primary Recycling is the processing of plastic scrap into the same or similar type of products using standard auxillary equipment.

Primary recycling involves using uniform uncontaminated plastic waste to manufacture plastic products. Only thermoplastic waste can be reprocessed. It can be used alone or as is the case more often, added to virgin resin at various ratios. Primary recycling can be performed by the processor in plant or through outside reprocessors. The main technical problems encountered in primary recycling are:

(a) Degradation of the material due to repeated processing, resulting in a loss in such properties as appearance, chemical resistance, processibility, and mechanical characteristics,
(b) Contamination of the reprocessed plastic, and
(c) Handling of low-bulk-density scrap such as film or foam.

Secondary Recycling

Secondary recycling is the processing of plastic scrap into products with less demanding properties.

Secondary recycling utilizes plastics waste unsuitable for direct reprocessing using standard plastic processing equipment. Despite the publicity received over the last few years, secondly recycling is still in its infancy. There are four main reasons for its slow development.

(a) Waste plastics tend to be highly contaminated with non-plastics substances (metals, sand) posing a danger to the processing equipment.

(b) Various plastics present in the waste used as feedstock might be incompatible, resulting in a product having poor mechanical properties,

(c) A feedstock with a consistant and reproducible composition is not always available, and

(d) In order to be economically viable, the product must be mass produced.

Tertiary recycling

Tertiary recycling is the recovery chemicals from plastics scrap. The process involves the pyrolysis of post-consumer waste.

Quaternary recycling

Quaternary recycling is the recovery of energy from plastics.

The first step in the recycling operation is the size reduction. This is accomplished with the help of crushers shredders, pulverisers and hammer mills. As substance separations involve much expense, the most frequent cases of recycling are always to be found where waste arises in pure state, i.e. not mixed with other plastics, paper, wood etc. When recycling homogeneously composed plastic waste one can often content oneself with purification and/or crushing or subsequent compacting (consolidating).

Another development trend is to avoid the crushing stage, and to insert the plastics waste directly into the extruder and to extrude them. This becomes more difficult with a blend of several types of plastics. Waste recycling companies, often carry-on with the manual separation process which apart from being not very reliable is certainly too cost-intensive for greater quantities of waste.

Plastics are being increasingly used in application where a limited life is required. These applications range from non-returnable packaging containers, of which plastics sacks, heavy gauge bags and drums utilise substantial proportion of the tonnage of polyethylene now manufactured; to products of longer life that will be used over a period of time and will, therefore require to have a period of useful life before being finally disposed of. In this category may be considered jerry cans, mulching films for agricultural use etc. Parts of motor car bodies which have been exposed to the environment for many years show that, even when the metallic part of the chassis are essentially broken down by corrossion, the rubber and plastic components remain relatively unchanged. This may well, therefore produce a long-term problem for the environment since, unlike an all steel chassis which can be compressed and the scrap metal reprocessed, plastics consists of a wide variety of chemical entities which can not be usefully reprocessed. Separation of plastics an rubber into their individual chemicals species on the basi of present technology presents in insurmountable problen from the economical point of view and, at present, incine ration seems to be the only viable alternative in spite of it associated atmospheric pollution hazard.

Problematic Properties of Plastics

Potential environmental hazard in plastic packaging field is because of advantages of plastics. On the contarary, cellulose, because, it is hydrophilic and is swollen by water, is subject to rapid degradation by water-borne bacteria. Paper and cardboard therefore disappear rapidly when exposed to the environment. Metal cans and drums, similarly, are rapidly reduced to rust when exposed to the environment, although ironically there is evidence here that surface coatings can extend the lifetime of a metal can beyond that which is acceptable.

Plastics are not wettable by water and do not absorb moisture to any appreciable extent. Becteria can not therefore attack them and the more stable ones, which include polyethylene and PVC persist in the environment for many years almost unchanged.

Alternate Disposal Techniques

Most plastics burn in a plentiful air supply to produce heat which can in turn be used to provide energy; an exception is PVC which does not burn readily, although it can be incinerated in combination with other waste. Some plastics, notably PVC, give off abnoxious gases, which not only constitute a toxicity hazard but also reduce the life of the incineration plant. There is evidence that both effluent and corrosion problems can be overcome but at a considerable cost. No useful products besides heat are produced by incineration and, as the amount of plastics in waste increases and public pressure for improvement in atmospheric pollution also increases, it must be considered to be of doubtful future viability on economic grounds.

Pyrolysis

Plastics can be decomposed at high temperatures in the absence of oxygen to give potentially useful chemical compounds. In some cases (e.g. polystyrene) the parent monomer can be recovered. But unless some prior separation process is performed in order to carry out individual pyrolysis of each type of plastics, the cost of separating the organic chemicals produced would probably be prohibitive. There is also a similar corrosion problem with PVC to that occuring during incineration. The most favourable application of pyrolysis is probably in tyres, from which useful chemicals have been recovered.

Biodegradable Plastics

The first approach is to make plastics as biodegradable as cellulosic materials. There are in principle, two alternative ways of doing this. The first is to synthesise new polymers which will be more susceptible to attact by bacteria than the present materials. This necessarily means that new plastics must be synthesised which are hydrophilic. In so doing, however, the useful moisture resistant properties of the plastics would be destroyed. In additions, the cost of any such specialised plastics would probably be prohibitive for general use. The second approach is to develop new bacteria which are capable of attacking massive plastics more rapidly. It is already known from study of bio-degradation of detergents that bacteria can accomodate to hydrocarbon feed stocks. However, there is no evidence that there is such a development in the offing in the plastics field and even if it did prove possible the ability to control such new rapacious bacteria in the environment is open to question. The probability is that they would also attack plastics products with intended long life as well as waste materials.

Photodegradable Plastics

The second approach, which has received some attention during the past two years, is the development of UV sensitive plastics which will be relatively stabel indoors, but will degrade rapidly under the influence of sun-light, out of doors. Again two different approaches have been taken. The first is to incorporate photosensitive groupings in the polymer backbone. These materials are also likely cost very much more than the common packaging materials. The second approach is to incorporate an additive during processing that does not interfere with melt stability at this stage but which accelerates photo-oxidataion during environmental exposure. Several chemicals compounds have been evaluated which accelerate the degradation of the common thermoplastic packaging materials by factors varying between 3 and 7 times. The polyolefins and polystyrene (including HIPS) are particularly susceptible to this process. PVC is less readily degraded due to the very considerable loading of stabilizer introduced to restrain colour formation during processing but which are also powerful UV stabilizers.

The application of photo-bio-degradation principle should add little to the cost of fabricated products since there is no interference with the processing operation. Although the initial application will almost certainly be to the problem of litter, where the environment for decay is most favourable, there is also the possibility of applying it to rubbish dumps and even to sewage by appropriate separation and treatment. It seems likely that in the future varying degrees of degradability will be built into a range or plastic products and although certain aspects require further research (e.g. a built-in early warning system for degradation) these problem are soluble in principle and there exists a real prospect that growth of plastics in packaging will not be limited by the problem or plastics litter.

The Future....

One solution to the growing problem of plastic waste is to control the use of these materials in packaging. This has begun to occur in the United States, where in 1989 the Suffolk Country of New York State banned "point-of-use" packaging. This ban covers poly(ethylene) bags, poly(styrene) hamburger boxes, and other disposable plastic packaging through the country's bars, restaurants, and grocery shops.

This kind of intervention by state or even national authorities is likely to become more common in the future. The use of polymers in packaging will probably be the subject of increasing control and by appropriate intervention may even be eliminated altogether. The growing concern about the environment is leading to the development of new markets and the rise of the "green consumer". Well-informed individuals choosing to avoid those items that make irresponsible use of polymers may well be the means of driving the market for polymers in a more environmentally acceptable direction.

Certainly polymers are the building blocks for materials with a desirable range of properties. Exploitation of the plastics will have to be carried out more thoughtfully in the future than it has been in the past. Moreover a range of social and political questions concerning their use and disposal will have to be faced and tackled in the near future.

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Export Oriented Pharmaceutical Projects

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India has certainly made significant break-through in the export of pharmaceutical products in recent times to sophisticated world markets. This has created great hopes for the Indian pharmaceutical industries in the coming years. While the statistics and the records show a positive trend with regard to the pharmaceutical exports, it is difficult to predict at this stage as to whether such growth trends would be sustained in the coming years.

A number of constraints are faced by the Indian Drugs & Pharmaceutical Industries in achieving further growth in the export front and boosting the export of the Indian made bulk drugs. Such constraints can be broadly classified under the following heads.

1. Poor reputation due to inconsistent quality standards of the products supplied mainly due to poor shop floor practices.
2. Inadequate R&D efforts and R&D base.
3. Poor "time culture" and consequent inability to meet the strict delivery schedules.
4. Poor quality of packaging of the products.
5. Low size and capacity of the units and consequent inability to generate adequate profits for ploughing in contінous cost and process optimisation measures, to stay at competitive level in the world market.
6. Poor image of the average Indian products abroad due to several slippages by Indian drug producers in meeting international commitments.

One can see that the above factors are of fundamental nature and require careful and far sighted measures to overcome them. Without solving these fundamental problems, it appears that any isolated efforts to boost export of drugs and pharmaceuticals would not provide significant and sustained benefits in the long run. There can be isolated achievements as in the recent past, but sustaining such achievements would be normally impossible without basic changes in approach and performance strategies by Indian Drugs & Pharmaceutical Industries in general.

We often take pride in some of the Indian units making praiseworthy achievements in the pharmaceutical export front. But, we should keep in mind that for everyone of such successful units who have made a breakthrough, there are atleast 20 other units who have failed in their endeavour. It is well known that even as a few units export drugs like ibuprofen, trimethoprim etc., there are a number of other ibuprofen and trimethoprim units in the country which remain closed or are struggling for survival.

Under these circumstances, any attempts to identify and put up export oriented bulk drug units, in isolation, may end up as an exercise in futility.

While a large number of bulk drugs for exports can be readily identified, it appears to be more worthwhile to shortlist a few bulk drugs that can be considered for exports, which may have specific advantages under Indian conditions.

A concerted effort on the national scale should be made to put up large scale plants for such chosen drugs with adequate computerised process control operations and R&D back up services. This would ensure adequate and consistant quality standards, concentrated marketing efforts, adherence to the schedules and development to long term export contracrts. Without a centralised national level planning by all the drug producers in the country and with the active support of the Government of India and Export Promotion Councils, such kind of plannings and programmes would not be possible for implementation. The large size units will enable the Indian exporters/producers to deal with the consumers directly, instead of through the dealers, as at present.

It appears that we have a lot to learn from the example of Chine who have entered the international pharmaceutical market in a very aggressive manner in recent times. As a matter of fact, Indian units appear to have lost orders in several cases due to competition from the Chinese in recent times. The main advantages for the Chinese drug manufacturer is the level of backing from its Government agencies, competitive price levels and the centralised planning for export that are made by the Chinese Government.

Considering the various constraints, one should also examine the feasibility of utilising the benefits offered by some of the Gulf countries like Oman and Dubai to put up industrial units in large scale in these countries. In such case, the export of technology, man power, plant and machinery as well as some of the raw materials from India would be possible to these units put up in these countries, which would in turn be able to produce drugs at internationally competitive levels. Export Oriented Units need not be established only in India. Location of units in such Gulf Countries, which are comperatively free of barriers, would result in considerable export of various services and materials from India.

It is also known that major "re-labelling activities" take place in Gulf, particularly in Dubai for export to Western countries. The drug formulation units operating from these countries have greater chance of acceptance in the world market, than similar formulation units located in India. It is generally known that many Indian pharmaceuticals (formulated bulk drugs) are not preferred in the Gulf and many other Western countries, perhaps due to "Brand loyalty" to the products of multinational companies.

Membranes in Food & Pharmaceutical Industries, Biotechnology and Other Applications

The Central Salt and Marine Chemicals Research Institute (CSMCRI) had organised a 'National Conference on Synthetic Membranes and their Applications' at Bhavnagar on November 29-31, 1991. In the following pages we present the abstracts of some of the papers presented at the Technical Session on use of membranes in food and pharmaceutical industries, biotechnology and other applications.

MEMBRANE PROCESS AND BIOCHEMICAL DOWN-STREAM PROCESSING, J.P. Choudhury, Department of Food Technology and Biochemical Engineering, Jadavpur University, Calcutta 700 032.

Over the past two decades membrane processes have become an important class of unit operation, with application in many industries. Initially it was introduced in water treatment industry to produce potable and ultrapure water. Recently there have been considerable applications in the food and dairy industries. Now, with the tremendous pace of development in the field of biotechnology and biochemical engineering, opportunities to apply membrane processes in the extraction, separation and purification of biological products are begining to emerge.

Various membrane processes are known today e.g. microfiltration, ultrafiltration, reverse osmosis, pervaporation, dialysis etc. and out of these, microfiltration, ultrafiltration and reverse osmosis have gained commercial importance for past two decades.

Intially natural polymers like cellulose acetate and its derivatives were being used for membrane making but with rapid advancement of polymer chemistry and polymer technology, at present a variety of polymers are being used for membrane synthesis.

Membrane processes offer unique separation possibilities in product recovery and pollution control of chemical, biochemical, food and pharmaceutical industries. The technology is used in pharmaceutical industries for concentration of bulk antibiotics, enzymes, vitamins etc which are produced in very low concentration during their manufacture. In dairy industry membrane is found to be ideal for concentration of milk used in ice-cream and cheese making. A large amount of whey which is discharged regularly in the effluent of dairy industry, contain whey protein, which can be recovered and concentrated by membrane process. This can also solve liquid pollution problems.

In the beverage industry membrane technology has been proved to be an important tool for clarification and concentration of fruit and vegetable juices. Essential oils from citrus fruit processing are of great importance in this industry. In traditional processing losses appear during extraction and separation. Citrus fruits, tomato and apple juices can be processed successfully with the application of membrane technology. Production of low alcohol content beer, recovery of ethanol from fermented broth and from distillery waste are unique applications of liquid-liquid separation by membrane process.

There are numerous applications of membrane processes and in this paper the discussion is limited to application of membrane process and technology in food, biochemical and biotechnological downstream processing.

DEVELOPMENT OF ULTRAFILTRATION MEMBRANES AND DEVICES FOR APPLICATION IN DAIRY INDUSTRY, K.S. Aggarwal, Membrane Research Unit, Advanced Microdevices (P) Ltd., Ambala Cantt 133 001.

The ultrafiltration membranes using cellulose acetate, polysulphones and regenerated cellulose as membrane materials have been prepared and tested for their applications in dairy industry. Experimental results obtained for concentration of protein in cheese whey are reported.

ULTRAFILTRATION TECHNIQUE FOR SHRIKHAND MANUFACTURE, D.K. Sharma, National Dairy Research Institute, Karnal 132 001 and **H. Reuter,** Institute fur Verfahrenstechnik, Bundesanstalt fur Milchforshung, KIEL, Germany.

Chakka, the base material for Shrikhand, could be successfully made by ultrafiltration using ceramic membrane module. There was 23% extra yield of chakka, when ultrafiltration was employed as against traditional method. This was due to the recovery of whey protein in chakka. Shrikhand of very good quality was made from this UF-Chakka.

Ultrafiltration of coagulated skim milk at pH 4.6-4.5 was done at $50 \pm 2°C$ with 4 bar transmembrane pressure and

5 m/sec velocity. Upto a concentration of 19.2 TS, the average flux was 86.13 1/hr M². This is a very high flux which became possible only by ceramic membrane module supplied by Ceraver, France. This new method has great scope of being used directly as an industrial process because of its inherent advantages of whey proteins recovery and easy automation and process control.

TRANSPORT OF WATER THROUGH CELLULOSE DERIVATIVES USED TO BE THE COVER OF OSMOTIC SYSTEM FOR DRUG RELEASE, Iordanskii A.L., Polishchuk A.Ya., Razumovskii L.P., Institute of Chemical Physics of the USSR Academy of Sciences, Moscow 117 334, USSR.

Besides other interests the study of physico-chemical parameters of water sorption and diffusion is attracting the attention of researchers in connection with the problem of evaluation of the properties of polymer systems for controlled drug release. This is due to the direct relation between transport characteristics of water and working features of covers of the osmotic drug systems. The main aim of the present study is to develop a reliable method of prediction of the mechanism and velocity of drug release based on the sorption and diffusion properties of water transmitting through polymer membrane.

The mathematical model of the diffusion-kinetic process and the set of experimental techniques are suggested in order to determine physicochemical parameters in question and to estimate the kinetic of drug release as well.

Cellulose diacetate (CDA), blends of CDA with cellulose acetyl propyl (CAP), cellulose acetyl fluorate (CAF) and its blend with cellulose triacetate (CTA) have been studied.

Mathematical model developed enables to predict the velocity of drug release at any time. The method of calculation of physico-chemical parameters required for this prediction is also suggested. This method is based on the experimental investigation of diffusion-kinetic process step by step.

It was shown that the laws of sorption and diffusion of water in CAD and CAD + CAP coincide with ones which are usually observed for moderately hydrophilic polymers. This causes main steps of drug release; (i) dissolution of the pill accompanied with the increase of the water flux through the polymer cover due to the change of solvent activity in saturated solution of the core; (ii) formation of the equilibrium concentration of saturated solution of drug and steady-state flow through membrane; (iii) the dillution of the solution of drug release following by the decrease of the velocity of drug release.

The study of the diffusion and sorption properties of CAP and the blend of CAF + CTA shows a number of properties useful for creation of the system of controlled drug release.

Slight plastification of these materials and the sorption mechanism explain some features of the solvent transport in comparison with cellulose diacetate.

The main feature of the laws observed is the linear increase of the parameters of water transport as growing of water concentration of polymer. This behavior of the concentration dependence of the diffusion coefficient could be explained by two opposite effects. They are accelaration of transport due to the swelling of matrix and its deccelaration due to the clasterification. Both of them characterises the moderately hydrophilic polymers.

The multilayer covers with different solubility of each layer is suggested to be the best way of the regulation of the velocity of controlled drug release.

CELLULOSIC MEMBRANES/MATRICES FOR CONTROLLED RELEASE OF DRUGS, Reena Jain and G.N. Mathur, Department of Plastic Technology, H.B. Technological Institute, Kanpur 2.

Controlled release drugs based on matrix type devices offer advantages like easier fabrication and no danger of abrupt release. Here the mechanism of drug release is diffusion controlled and drug is homogeneously distributed in the polymer. In the present study the polymeric matrices (in the form film) based on Ethyl Cellulose have been investigated for their controlled release propeties. Variations in drug loading amounts, drug type, matrix thickness and polymer molecular weight has been done in order to study their effect on release rates/patterns. The devices exhibit first order release and exhibit 'burst effect'. It has been found that drug release increases sharply from 26.6 mg. (63.39% of total drug present) to 10464 mg. (82.6%) in a non-linear order as percentage drug loading is increased from 16.6% to 50.0%. The rate of release goes down as molecular weight of Ethyl Cellulose is increased from 6000 to 20000. The matrix thickness also significantly reduces the release rates. It has been found that release duration increases from 10 to 22 days as the matrix thickness is increased from 94 μ to 226 μ keeping the drug loading constant. It has been established that by using different model drugs the release rates vary greatly due to differences in polymer/drug solubility and diffusion characteristics. The study suggests further investigations of the remaining parameters like plasticizer content, additives, thickness of hydrodynamic diffusion layer in order to preselect a matrix composition for desired release pattern.

PRODUCTIVITY IMPROVEMENT USING MEMBRANE TECHNOLOGY - UPSTREAM/DOWNSTREAM APPLICATION, I.C. Sahu, Department of Technical Services, Hindustan Antibiotics Limited, Pimpri, Pune 411 018.

After discussing in brief the trends in manufacture of Antibiotics, the paper presents the application of membrane technology in upstream and downstream of manufacturing as tried at Hindustan Antibiotics Ltd., Pimpri.

Membranes in Effluent Treatment and Pollution Control

DYE SEPARATION AND CHEMICAL RECOVERY FROM FIBRE DYEING EFFLUENT BY MEMBRANE PROCESS, B.D. Thakur and A. Majumdar, Northern India Textile Research Association, Raj Nagar, Ghaziabad 201 002. AND **B.K. Guha,** Department of Chemical Engineering, Indian Institute of Technology, New Delhi 110 016.

The waste water resulting form textile dyeing operation contains a substantial amount of unabsorbed dyes, various auxiliary chemicals which are used during the dyeing process and other contaminants. The study was aimed at the selective separation of dyes from other auxiliary chemicals like acetic acid and levelling agent present in the polyester fibre dyeing effluent by highly porous Cellulose Acetate (CA) membrane prepared in the laboratory.

The separation studies with the prepared membrane were carried out in a laboratory set up designed and fabricated to operate upto 100 kg/cm^2. The set up is equipped to operate with four membranes either in series or in paralled at any particular time. The membranes were initially tested to determine its transport properties. These were then tested with laboratory prepared test solution to simulate the actual waste water characteristics for the determination of the separation of individual chemical components, viz. dye, acetic acid and levelling agents. Experiments were conducted with aqueous solution containing only disperse dye as well as combinations of dye plus acetic acid and dye, acetic acid and levelling agent. The temperature and circulation rate were kept constant at 22 $\pm$ 2°C and 2 l/min respectively. Experimental results obtained with such membrane for different solution systems indicate a nearly linear increase in permeate flux with pressure deviating at higher range. This is quite normal and is due to the compaction and other membrane deficiencies observed for highly porous membaranes.

The flux rates obtained were quite high and are comparable with most commercial membranes for the pressure range of operation (0.8 - 1.5 m^3/m^2/D at 3.5 mpa). The results indicate that 100% dye separation occuring for each of the three systems at all pressure of operation. However acetic acid separation amounted to less than 8-10%. Thus nearly 90% of the original acetic acid content flows through the permeate water and this can be reused along with the water.

The results observed for the levelling agent are somewhat more complex. Because of the complex nature of the levelling agent C.O.D. (Chemical Oxygen Demand) value and T.D.S. (Total Dissolved Solids) contents were used as the indicator for its quantity. These values were measured and the data indicate the extent of separation to be 40%, showing 60% passage through the membrane. It is interesting to note the presence of either levelling agent or acetic acid does not interfere with the separation of dye. The acetic acid permeation is also not affected by the levelling agent itself. Thus it may be concluded that the membrane separation could be successfully employed for the 100% removal of dye component and selective recovery of acetic acid and other chemicals to the extent of about 90% and 60% respectively.

APPLICATION OF MEMBRANE CELL FOR POLISHING LOW LEVEL RAD-EFFLUENT FROM REDIOCHEMICAL PLANT, R.K. Singh, M.K.T. Nair, A.K. Venugopalan and D.S. Divakar, PREFRE Plant, BARC Complex, Tarapur 401 502.

Radio-chemical plants generate a large volume but extremely low activity level liquid effluents. It is good to treat these effluents too for the entire removal of activity before discharge. Radio-isotopes normally present in the effluent are in ppb range or less. Electrodialysis has several advantages over the conventional techniques like carrier precipitation, ion exchange and reverse osmosis in removing low concentration of ionic impurities from liquid effluents. Polishing of these radio-active effluents using membrane cell has been studied and reported in this paper. In the first phase, a single stage dialyser unit containing one pair of cation and anion membrane was used. Based on the results obtained with this cell, a three stage dialyser unit containing 8 parts of cation and anion membranes per stage was fabricated and used.

REMOVAL OF PHENOL FROM REFINERY WASTE WATERS BY LIQUID SURFACTANT MEMBRANES IN A CONTINUOUS COLUMN CONTACTOR, A.N. Goswami, S.K. Sharma, Anshu Sharma and T.C.S.M. Gupta, Indian Institute of Petroleum, Dehradun 248 005.

The novel separation technique of liquid surfactant membranes permeation has recently been industrialized for waste water treatment. There have been very few studies reported on liquid surfactant membrane separations in continuous scale equipment with most studies dealing with batch-scale extractions. This paper reports experimental data on continuous scale extraction of phenol which is a typical toxic pollutant present in refinery waste waters using liquid surfactant membranes in counter current Oldshue Rushton type stirred column. Experimental data have been generated under a range of operating parameters like flow rates, phase ratios and measurements include mass transfer, drop sizes ans dispered phase holdup. The effect of these parameters on extraction of phenol have been analyzed.

News from Abroad

JOINT VENTURE BETWEEN DEGUSSA AND BIOTIKA FOR THE MANUFACTURE OF AMINO ACIDS

Degussa AG, of Frankfurt am Main, a leading manufacture of amino acids for use in animal feed and the pharmaceuticals industry, and Biotika AG, of Slovenska Lupca, a renowned Slovak company in the field of pharmaceuticals and biotechnology, which was privatised at the start of May 1992, recently signed a declaration of intent on the establishment of a joint-venture company at a ceremony attended by the Slovak Deputy Minister for Industry.

The new company is to manufacture amino acids by fermentative processes, on the basis of Degussa's and Biotika's technical expertise. Since Biotika has free capacity for fermentation processes, production of L-threonine, L-tyrptophane and L-lysine will be able to commence very shortly. Degussa's worldwide sales organisation means that market potential can be rapidly exploited. The company will have around 250 members of staff.

JOHNSON MATTHEY ON THE WAY TO RECOVERY

Specialist materials and precious metals group Johnson Matthey Plc says it is well poised for growth once the UK and US economies emerge from recession. Group Chairman **Mr. David Davies** said, "Economic growth and improved metal prices will certainly be needed if we are to show a significant increase in company profits in the coming year".

He added that the group has been able to maintain profit at a "satisfactory level" in the last two years due to cutting stocks, manning levels and associated costs. Group pre-tax profits to end-March 1992 were flat at £66.3 million after £66.1 million previously.

Davies said the company was still waiting for signs of an upturn in the US and UK but it now had "some measure of optimism". Operating profits at its catalytic systems division, which makes vehicle autocatalysts, were up 28 per cent to £22.5 million. Davies said the division was doing well in both, a difficult North American market and a rapidly growing European one.

The demand for autocatalysts in Europe had grown rapidly in the run-up to emissions legislation affecting all new cars. The performance in North America had also been particularly encouraging in the worst year for US auto sales since 1992. The group said the European autocatalyst market is growing rapidly and its rationalisation programme is nearing completion.

Despite a tough market, its colour and print division reported profits up 41 per cent to £11.1 million, thanks to successful rationalisation. Precious metals profits were down 23 per cent to £20.6 million mainly due to lower prices for metal, particularly platinum and rhodium. The group said that in its last two financial years the average price of platinum has fallen to £211 an ounce from £243 and rhodium has fallen to £1,773 an ounce from £2,348.

Johnson Matthey's materials technology divisional profits rose 11 per cent to £19.8 million, mainly due to its European business which is being further restructured to cut costs. The group said a slightly firmer US dollar against sterling meant that overseas operating profits were £1.6 million higher than if they had been translated at last year's exchange rates.

ENICHEM STEPS UP PLASTICS ADDITIVES

Enichem Fine and Specialty Chemicals group has confirmed plans to build two antioxidant production plants in the US and Singapore in the first step of a four-year, \$140m investment drive to lift its presence in the Ciba-Geigy dominated world plastics additives business. The additions, together with expansions of existing units in Italy, will give it 22,000 tonne/year production capacity in the plastics additives field the end of 1995, president of the group Alessandro di Mattia said in San Antonio recently.

The \$38m investment comprises a 3,800 tonne/year plant at Baytown, Texas, adjacent to Enichem's new thermoplastic rubber facility which is due onstream in the third quarter of this year. The antioxidants unit is due to start in 1994, and will be mirrored by the 3,800 tonne unit due to start shortly after in Tuas Bay, Singapore.

Current Enichem phenolic and phosphite antioxidant capacity is 7,500 tonne/year, located principally in Italy at Ravenna and Pedrengo. A portion is made in the US by Ferro under a transitional tolling arrangement which may be ended when the new production begins. Further capacity additions are planned in other plastics additives. *Uvasil 299* Hals (hindered amine light stabiliser) production in Trissino, Italy, will be lifted from the current 300 tonne/year pilot scale to full industrial production of 1,500 tonne/year by 1994. And semi-commercial production of non-halogenated flame retardant Eniflam 6 and new antioxidant Silanox is planned from 1993.

Currently, Enichem takes a 25 per cent share of the European plastics additives market, but has little presence elsewhere. The business has sales of \$100m. The group is aiming to achieve a similar market share in the Far East and the US. The plastics additives push forms part of a wider strategic drive to increase the size of Enichem's specialities business. A four-year programme underwritten by investment funding of up to \$420 million has been approved to achieve this.

In addition to plastics additives, key strategic businesses are based on its proprietary dimethyl carbonate (DMG) chemistry and its aromatic-based fine intermediates.

The DMC strategy is based on marketing the chemical for carbonylation or methylation as an alternative to phosgene, dimethyl sulphate and methyl chloride. The production route is based on methanol and carbon dioxide, and avoids the potential toxic risks of its competitors, Enichem claims. Existing users of the technology include Sandoz, for agrochemicals in the US, and GE Plastics, which uses an Enichem diphenyl carbonate route to polycarbonate.

Potential strategic targets for the technology include large-scale phosgene derivative production, non-toxic solvents, octane boosters, and most important, oxygen contributor in fuels. 'An improved DMC technology has been developed to comply with the large volumes required in the fuel and solvent area', di Mattia says. 'Production units on a commercial scale, up to some hundred thousand tonne/year, could become a reality'. Enichem is negotiating with a number of large international groups for further collaboration on the DMC technology, but di Mattia declined to say which.

MONTEDISON PINS HOPES ON NEW MATERIALS

By the year 2,000, Montedison expects over half of its chemical revenue to come from new materials, according to Italo Trapasso, Vice Chairman of Montecatini. In 1991, new materials accounted for 37 per cent (S957m) of total chemical revenues.

Montecatini offers a broad range of new materials, including polyolefin-based advanced materials from Himont, fluorinated materials from Ausimont, and composite and advanced materials from the Tencara system. During the 1980s, demand for all of the major families of advanced materials grew rapidly, and is expected to accelerate further during the 1990s, with new materials substituting traditional materials in many sectors. Trapasso also announced that Montedison will establish an international centre linked with the group's global industrial and market system for technical support and communications on new materials.

SHELL SPLASHES OUT ON GOODYEAR'S PET RESINS

Shell Chemical has signed a letter of intent to acquire Goodyear's polyester resins business, which Goodyear put up for sale last year, shortly after selling its polyester tyre cord and fabric plant to Akzo. The deal includes a newly announced $63.5m expansion in PET resin capacity at Goodyear's plant at Point Pleasant, West Virginia.

Goodyear's films division, which includes a variety of cast and blown films for industrial and food applications as well as Reneer laminates, was also put on the block late last year.

And following comments by the group chairman that any non-core businesses could be looked at with a view to sale, speculations has also surrounded the future of Goodyear's conveyor belt and chemicals businesses. Chemicals activities focus on rubbers, latices, resins and rubber chemicals.

In 1991, Goodyear's $10.9 bn net sales were split $9 bn from its core tyres business and $1.9bn from 'general products'. Operating income was split $214m from general products and $620.8m from tyres. Overall net income was $96.6m, up from a net loss of $38.3m the year previously.

The principal product of the Goodyear polyester resins business is polyethylene terephthalate, used in the manufacture of beverage bottles, food containers and other thermoformed packaging. It also produces food-grade Repete resin which uses recycled [illegible] tles to make new food containners

Central to the proposed deal is [illegible] manufacturing plant at Point Pleas[illegible] West Virginia, for which Goodyea[illegible] board has just approved an expans[illegible] to increase PET resin production ca[illegible] city by over 35 per cent from the c[illegible] rent 245,000 tonne/year (540m lb/ye[illegible]

This is due to be completed by [illegible] first quarter of 1994. Also included [illegible] the aggrement is a technical centre [illegible] Akron, Ohio, and sales and marketi[illegible] support groups. In all, some 7[illegible] employees will be affected, all of wh[illegible] are expected to transfer to Shell, follo[illegible] ing quoted comments by the compa[illegible] that it regards the staff as an integral p[illegible] of the business.

The deal has been described as t[illegible] largest in four years for Shell Chem[illegible] cal. President **Mr. Michael Grasl[illegible]** said Shell was interested in acquiri[illegible] the business because of the strong com[illegible] petitive position it holds in what is [illegible] rapidly growing field. It is also intend[illegible] to complement Shell's existing techno[illegible] logy and feedstock capabilities. Th[illegible] company is expanding PET capacity i[illegible] the UK and Italy.

The acquisition is still subject to th[illegible] negotiation of a definitive sales agree[illegible] ment, approvals by both companies an[illegible] relevant authorities, but is expected t[illegible] be completed within three months, sai[illegible] a Goodyear spokesman.

DU PONT TO TAKE CHARGE O[illegible] AT LEAST $100m

Du Pont, the leading US chemicals group, is expected to record an extraordinary second quarter after-tax charge of $100m to $135m as a result of settlements of claims by horticultural growers that the company's Benlate DF anti-fungus product has damaged crops.

The charge, based on the company's announcement, that it expected a

second-quarter charge against earnings of 15 to 20 cents a share, would bring total fungicide payments by Du Pont to between \$3.15m and \$350m on an after-tax basis.

Last year, Du Pont took charge of 32 cents a share after-tax, or \$215m, because of fungicide claims. Analysts expect the special charge could reduce expected second quarter earnings of Du Pont from \$571m, or 85 cents a share, to around \$436m, or 65 cents. The company's first-quarter earnings declined by 18 per cent to \$482 m.

The fungicide powder was withdrawn from the US market in March 1991 after flower growers and other agricultural customers complained of plant damage resulting from the product, known as Benlate dry flowable.

Mr. William Kirk, general manager of Du Pont's agricultural products division, said some claims rejected by the company were still being pursued by growers in legal actions. However, he predicted that 90 per cent of the claims would be settled or rejected by the company by the end of June.

DECLINE IN PERU'S OIL IMPORTS

Peru's crude oil imports of about 45,000 barrels per day (BPD) will fall marginally over the next few months following a gradual improvement in oil production, according to Jaime Quijandria, Chairman of the state oil company Petroperu.

Quijandria said that Peru's oil production increased to an average 117,169 bpd in the first 11 days in June, compared with 115,582 bpd for the month of May. This is unlikely to make an immediate difference to imports, Quijandria said. But he expected production to reach 120,000 bpd by next month and to continue to grow gradually throughout the year. Local fuel sales hover around 106,000 bpd, but refinery runs need up to 160,000 bpd. The increase in June's crude oil output came from improved production in Occidental Petroleum Corporation of Peru's northern jungle fields and offshore output from Petroperu's offshore affiliate Petromar, following the drilling of development wells. Occidental, is drilling its fourth development well in northern jungle block 1-AB under a 1992 10-well drilling programme.

SAGA PETRO'S SNORRE FIELD TO GO ON STREAM

Saga Petroleum A/S said its Snorre North Sea oilfield was expected to start production next month and would reach 117,000 barrels per day (bpd) output by the end of the year. Saga spokesman Oeistein Oeisjoefoss said production from Snorre, the first tension leg platform in the Norwegian sector of the North Sea, was due to rise gradually from about 46,000 bpd in July. He gave the following projected rate of rise for this year: August 57,000 bpd, September 89,000, October and November 112,000, December 117,000. At its eventual peak, Snorre is expected to produce 160,000 bpd. Snorre crude will be piped to Statfjord and its crude blended in with Statfjord's production before shipping.

Oeisjoefoss said there was no reason to expect a reduction in quality of the Statfjord crude after the Snorre input. "The quality of Statfjord crude has always fluctuated a bit over the years. Out tests show that the crude will stay within the range of its normal fluctuations once the Snorre oil is added," he said.

DEGUSSA INTERIM RESULTS FOR FIRST HALF OF 1991-92

Degussa has announced the interim report covering the development of the Group during the first half of fiscal year 1991/92 (October 1991 to March 1992).

Lower precious metals trading sales

Group sales of DM 6.1 billion were down by 7% during the first half of the year. The relatively high decline (15%) in the Metals Sector sales was a result of a lower volume of precious metals trading as well as the sale of several operating areas.

In the chemical sector, sales were 1% lower than in the previous year. In contrast the pharmaceuticals sector realized an 18% increase in revenues. Without precious metals trading turnover, overall group sales were just under the previous year's level.

The foreign share of sales was down slightly from 69% to 68%. The sales of Degussa AG were also influenced by the decline in the previous metals trading turnover. During the first half of year, revenue declined by 10% to DM 3.2 billion, while without precious metals trading the figure was 1% higher than in the previous year.

Group income surpasses previous year's level

Group income before income taxes increased by 7% to DM 100 million. The corporate sectors showed the following results:

In the metal sector, losses were further reduced. Progress in the restructuring of the Leybold Group contributed to this achievement. During the second quarter, the chemicals sector profited from a stengthening in demand for some products; however, prices remained at unsatisfactory levels.

Although results for the first half of the year were below the previous year's figure, the rate of decrease slowed considerably.

In the pharamaceuticals sector, the favourable development of profits continued. Due to strong domestic and foreign demand, the results of both the Asta Medica Group and the Dental Division again improved considerab Degussa AG's income before inco taxes amounted to DM 57 million. T was 19% below the previous yea figure while the first quarter results h been 46% below prior year.

Investments at normal Levels

Additions of DM 277 million (pr vious year: DM 397 million) to pro erty, plant and equipment for the Grou were considerably below the previo year's record figures. The corre ponding figure for Degussa AG is D 84 million for the first half year (pr vious year: DM 132 million). Th investment activity focused on th expansion of capacities in the core ope ating areas of the chemical sector, i.e active oxygen (U.S. and Belgium) animal feed additives (U.S.) and auto mobile exhaust catalytic converter (Germany and Brazil). Additional larg projects are the expansion of pharma ceutical research and the consolidation of dental activities at the Hanau Wolf gang site.

APPOINTMENTS/CLASSIFIEDS

SURFACTANTS

Competition hots up for commodities

Long-established debates over natural versus synthetic surfactants have been overshadowed by simple market economics. Oversupply, fierce competition and squeezed margins now dominate commodity surfactant discussions in western Europe.

Commodity surfactants trends have for some years been typified by a series of debates, notably the pros and cons of natural versus synthetic and alcohol versus benzene based precursors. The last year has seen the passion of both contentions quenched by free market economics. More sophisticated environmental thinking coupled with soaring coconut prices has eroded some of the certainty of the 'Natural is Good' dogma. And the more dramatic forecasts of declining linear alkyl benzene (LAB) use in favour of alcohol derivatives such as alkyl sulphates (AS) and alkyl ethoxy sulphates (AES) have been moderated as new announcements of LAB plant builds continue across the world.

More current, in Europe at least, is discussions of overcapacity, fierce competition and squeezed margins. The pressures multiply down the product chain as major soapers face increasingly aggressive competition and purchasing power from more consolidated supermarket chains with greater muscle. The west European market for household detergents, the largest surfactants outlet, is growing very slowly. Most countries already have a high standard of living, and trend towards compact products and more efficient use of chemicals will help cancel what expansion might have been anticipated.

Joel Houston of Colin A Houston & Associates suggests current surfactant usage in west European primary detergents will grow only marginally from just under 1.2m tonne in 1990 to under 1.3m tonne in 2000. He expects west European household product production to decline through the decade, largely at the expense of fillers, from 8.3m tonne in 1990 to 8.0m tonne in 2000, though this is less reliable as an indicator than it may seem.

'The trend towards minimisation, which began in fabric softeners, has continued to gain momentum and is obscuring growth in usage,' he says. 'For example, although laundry powders will decline at an average of 1.5% per year on a volume basis due to concentration, usage of powders expressed as conventional product will actually increase annually at about 2% between 1990 and 2000'. Despite this staid outlook, there are fairly strong substitution trends at work which allow individual surfactant types to outpace the average, though of course at the expense of less fortuna candidates. Anionics, for example, representing around 54 of the 1.75m tonne market by ICI's estimation, are foreca to grow overall at 3.3% a year to 1995 by Hewin Intern tional. However, AS and AES will grow 10.9% and 9.4 a year, respectively according to Hewin, largely at the expen of linear alkyl benzenes (LAB) which are expected to manag just 0.7% per year.

Houston takes a similar view, estimating LAB could se 5% a year market shrinkage, though he stresses that this particularly difficult to forecast. Shell, which shares the Eur pean lead in synthetic alcohols with Enichem, not surpris ingly echoes this vision, having exited the LAB/LAS mark with the closure of its 100 000 tonne/year Shellhaven plan 'We already see some markets/customers eliminating c reducing the use of LAS in washing up liquids and use alco hol ethoxylates, ether sulphates and sulphates instead', She spokesman said. 'The success of compact powders is als in our favour, the use of ethoxylates is increasing and als here LAS is beginning to be replaced by alcohol sulphates'.

However, Europe's leading ethoxylator ICI takes a mor conservative view of the trend. ICI Surfactants, business plan ner Pauline Short expects gentle erosion away from LAB/LAS rather than any dramatic move. 'I don't see the trend as signalling the end of the LAB market', she says. The argument that LAB does not fully biodegrade Short questions on a number of bases. LAB has been extensively studied and is believed to be biodegradable in excess of 90%. It is also thought to be almost completely removed in effluent treatment, she says. However, LAB is easy to detect at low levels and even though it appears to have no negative effect on the environment the fact that it is there at all has led to considerations about replacement products.

Potentially more damaging long term for European LAB producers is the build-up of new capacity in traditional export outlets. Accurate trade figures for chemicals such as LAB are notoriously difficult to come by. However, best estimates suggest exports in the hundreds of thousands of tonnes. China, which produces only 80,000 tonne/year of LAB, is a sizeable importer to balance its 180,000 tonne/year requirement. However, a 72,000 tonne/year plant currently under construction in Fushun, Liaoning is due to start up later this year. Other Asian projects include 40,000 tonne/year planned at Mab Ta Phut in Thailand, while in the Middle East Sabic is studying a 50,000 tonne/year plant at Yanbu in Saudi Arabia, and Alastra has a further 25-35,000 tonnes/year planned at the same location for start up in 1998.

Most recentluy, it emerged that Pemex is talking with two potential partners about the possibility of building a grass roots LAB unit in Mexico. The Mexicans have been switching from branched to linear alkyl benzenes, a move that has helped tighten world LAB markets. Currently LAB/LAS take some 55-60 per cent of the 950,000 tonne anionics west European market and routinely undercut alcohol-based surfactants on price, a key consideration in the price-conscious commodity market.

Short-term average annual growth rates for surfactants, 1991-1995 (%)

	US	Western Europe	Japan
LAS	1.1	0.7	(1.2)
AS	4.9	10.9	9.1
AES	4.0	9.4	
AOS			9.0
SAS		4.0	
Soap	4.5	3.8	4.8
Other anionics	13.5	2.5	3.9
Quasi surfactants	2.6	3.0	
Aggregate	3.9	3.3 3.5	

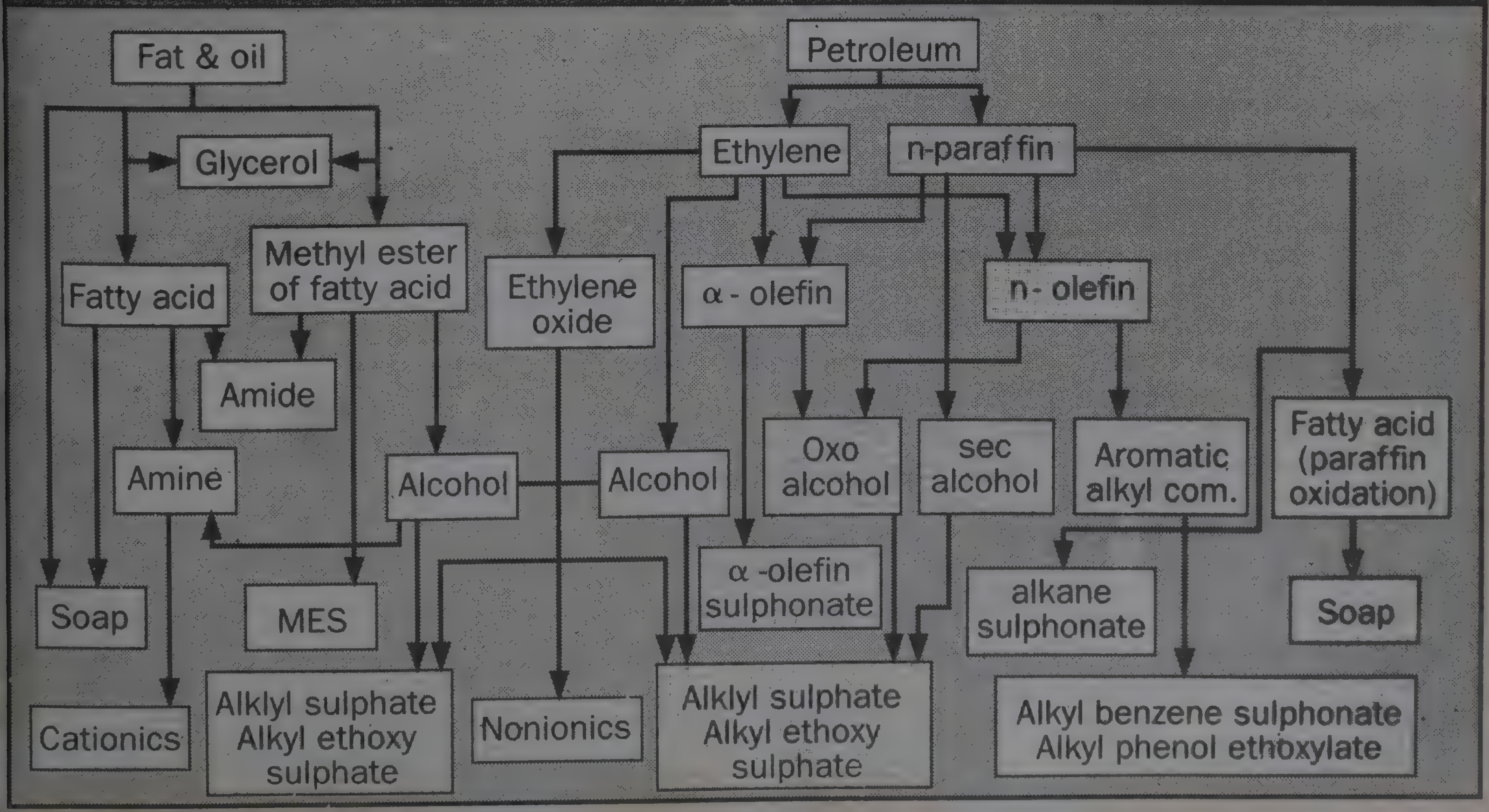
Source: Hewin International.

Alcohol-dervived surfactants are not without their problems, however. These span both the anionic and nonionic markets, the latter accounting for some 600,000 tonne/year capacity in Europe, or 35-36 per cent of the total surfactant nameplate. Detergent alcohol capacity in Europe is estimated by ICI at around 550,000 tonne this year, with perhaps 55 per cent running on natural rather than petrochemical feedstock. Plant loading is understood to be more than 80 per cent. With a lot of new capacity coming onstream in the next few years, largely based on vegetable oils, there is little sign that competition will ease.

However, the synthetic alcohol producers earned a respite in their battle with the natural product. Significant price hikes in coconut oil in the last year, prompted by drought in the Far East, have coincided with the slump in the ethylene price, reversing the price advantage once enjoyed by natural alcohol surfactant producers. Ethoxylates are oversupplied to an even greater extent, with plant loadings estimated at 70-75 per cent. There seems little doubt that a number of players will be forced to close, the most likely candidates are those that have not integrated production with ethylene oxide supplies.

Shell believes the ethoxylates market grew only 1 per cent last year. But this makes a decline in the use of long chain ethoxylates and growth in short chain, prompted by the increasing use of compact powder. The result has been increasing consumption of alcohols, reduced consumption of ethylene oxide and further overcapacity in ethoxylation —the latter because short chain product requires a shorter residence time in the ethoxylation reactor.

Synthetic routes for typical surfactants



World outlook for anionic surfactants, 1995 ('000 tonne)

	HH	PC	IIC	Indl	Total
US					
LAS	428		33	40	501
AS	157	42	9	9	217
AES	225	26		10	261
SAS					
Soap	130	400	35	10	575
Other anionics	142	33	11		186
Quasi-anionics				438	438
Western Europe					
LAS	460		43	43	546
AS	95	21	7	7	130
AES	85	50	38	3	176
SAS	89				89
Soap	330	265	42	6	643
Other anionics	141	12	20		173
Quasi-anionics					355
Japan					
LAS	76		18	8	102
AS	35	8	4	4	51
AES	53	17		5	75
AOS	56		3	3	62
Soap	74	110	5	3	192
Other anionics	36	6	3	12	57
Quasi-anionics					70

HH, household cleaners; PC, personal care products; IIC, institutional and industrial cleaners; Indl, industrial applications.
Source: Hewin International.

Ethoxylate oversupply problems have also been worsened by the brief popularity of heavy duty liquids in the late 1980s. The resulting ethoxylate boom has since been eroded by the loss of market share of HDLs in favour of compact powders. Capacity additions however are still materialising. Enichem completed a 50,000 tonne/year ethoxylates plant at Gela, Italy, in April and sells to the major detergent producers, such as Henkel and Procter & Gamble. Swiss family firm, Dr. W. Kolb, is currently, building a 20,000 tonne/year ethoxylates plant at Moerdijk, the Netherlands, which is due on stream this December. The end-use will be largely for non-ionic, personal care, emulsifier, and oil drilling products. Dr. W. Kolb already operates a large plant at Hedingen, Switzerland and plans to produce more specialised products there. There are also several plants planned or under consideration in Europe. Turkey's Petkim is considering a 10,000 tonne/-year ethoxylates unit at Aliaga, though this is not in its immediate plan.

European leader in natural alcohol based surfactants Henkel, has various projects lined up. At Cologne it plan a 40,000 tonne/year ethoxylates unit, due to be built next year The local authorities are now studying the planning application, and if is granted the plant would take around one yea to build. Henkel hopes to bring it onstream in early 1994 **(Courtesy:** European Chemical News)

News From Japan

ITALY'S UNIQUE SODA PROCESS NOW ON MARKET

Mitsui & Co., Mitsui Engineering & Shipbuilding Co. and Permelec Electrode Co. have started joint marketing in Japan of the "Hydrina" caustic-soda production process which by-produces no chlorine. The process was developed by De Nora Permelec S.p.A. of Italy.

Hydrina is a new-type ion-exchange membrane process producing caustic soda from Glauber's salt, etc., without by-producing chlorine. The new process features low production cost and considerable energy saving. The process, which has already been commercially applied at a plant belonging to Italy's major fiber maker in the suburbs of Milan, is starting to attract industrial attention in Europe.

The three firms expect the Hydrina process to increasingly absorb the attention of those involved in Japan where concern over caustic-soda and chlorine demand imbalances has been increasing. De Nora Permelec is an Italian electrode maker known for its insoluble metal electrodes, etc. Permelec Electrode is a Japanese joint venture based in Fujisawa, Kanagawa Prefecture, and owned 50 per cent by De Nora Permelec, 40 per cent by Mitsui & Co. and 10 per cent by Mitsui Engineering and Shipbuilding Co.

The Hydrina process is said to require 1,700-2,000 KWh of electricity to produce 1 ton of caustic soda, whereas conventional ion-exchange membrane processes need 2,200-2,500 KWh. The new process is also simpler and easier to operate.

SHODEN, HIMONT TO SET UP JV FOR POLYMER ALLOYS

Showa Denko K.K. (Shoden) and Himont Inc. of the U.S. have basically agreed to set up a joint venture in Japan for manufacture and sales of polypropylene (PP)-based polymer alloys produced by the Catalloy process developed by Montecatini, a parent firm of Himont.

The two firms have so far conducted feasibility studies on the joint project and will soon conclude a formal agreement. The new firm will import the products into Japan from the U.S. firm and market them for the time being, with a plan to produce them if demand shows a sufficient rise.

The Catalloy process features polymerisation of different polymers as polymer-alloy components to perform direct production of a polymer-alloy. It is claimed that this process enables use of a wide range of polymers covering polyolefin to thermoplastic elastomers to obtain a variety of unique plastic alloys having better properties than other equivalents.

In particular, the new firm will apply the process to manufacture of PP-based polymer alloys having properties conventional polymers lack. Shoden has teamed up with Himont regarding PP resin produced using the Catalloy process and conducted studies on commercialisation of such polymers in Japan.

This is in line with Shoden's other PP project to construct a PP plant adopting UCC (U.S.)'s vapor-phase process. These projects mirror Shoden's policy of deploying PP operations covering the commodity and specialty types. The firm hopes the new plastic alloys will find increasing markets for use in cars, consumer electronic/electrical appliances, packaging and fiber products.

DOW STARTS TECHNICAL CENTER FOR ESSEX'S CAR-USE ADHESIVES

Dow Chemical Japan Ltd., has announced that it has established a technical center in Gotemba (Shizuoka Prefecture) to enhance technical services regarding car-use glass bonding systems, reinforcing materials and structural adhesives etc., supplied by the Essex group which Dow Chemical took over in 1988.

This is specifically intended to improve such services for Japanese car makers operating transplanted plants in the U.S. Dow's Japanese subsidiary also plans to produce Essex products in Japan in future; it will import the products for the time being from the U.S. for sales to Japanese automotive OEMs and repair businesses.

After taking over the Essex group in 1988, Dow has been deploying global operations for car-use glass bonding systems, reinforcing materials and structural adhesives through its two wholly owned subsidiaries — Essex Specialty Products, Inc. for North & South America and Asia, and Gurit-Essex AG for Europe and Africa. The former has commanded a 95 per cent share of the U.S. market for automotive-glass bonding agents (100 per cent for America's big-3 car makers and 65 per cent for Japanese car makers operating in the States); the latter, an 85 per cent share in Europe.

In Japan, Sunstar Engineering Inc. of Japan had manufactured and sold certain Essex products under the license granted by Essex which terminated at the end of April, 1991. Thereafter the licensing agreement was not renewed and now only Dow can supply such products in Japan. Dow has a plan to construct a production base or bases in Asia including Japan by 1997 in order to satisfy the demanding needs of users throughout the world.

ASAHI CHEMICAL FAILS TO ATTAIN ¥1,000 BIL. SALES

In the business term ending last March, Asahi Chemical Industry Co. registered annual sales of ¥974,848 million ($7,499 million; up 1.0 per cent

over preceding year), pretax profits of ¥54,210 million ($417 million; down 28.2 per cent) and net profits of ¥29,348 million ($226 million; down 24.1 per cent). Chemical, resin and fiber sales were sluggish but housing/construction and diversified operations were in good shape. Housing/construction business accounted for 53 per cent of the company's pretax profits, reflecting declines in chemical/resin marketing.

Looking at sales by sector, chemical products and resins (component ratio: 37.8 per cent) dropped 7.1 per cent due mainly to a sharp decline in styrene regarded as a staple item. Housing/construction (36.3 per cent) attained robust growth of 8.5 per cent owing to consumers' inclination towards upgraded housing.

Fibres dipped 4.9 per cent in response to inactive industrial applications (nylon, etc.). Polyester-yarn business made a good showing in Japan last year but occupied only a small share in the company's fiber operations. Diversified operations (9.7 per cent) surged 24 per cent thanks to the merger of Toyo Jozo and rapid expansion of biotechnology/-medical business.

Double-digit declines in operating, pretax and net profits can be attributed to the increased costs of the goods sold, rising marketing/managerial costs and monetary imbalance. Plant-and-equipment investment in the same term stood at ¥76,200 million ($586 million), down 2 per cent.

TORAY TO PRODUCE IN UNITED STATES CARBON-FIBRE PRE-PREG FOR BOEING USE

Toray Industries, Inc. is due to set up in June a wholly owned subsidiary —Toray Composites America Inc. —in Washington State, the United States. The U.S. subsidiary is scheduled to start operating in July, 1994 a 1.3 million-m²/y plant for prepreg — a combination of carbon fiber with high tenacity epoxy resin. The product has recently been certified as suitable for primary structural material for Boeing airplanes. Toray expects the U.S. subsidiary to help thrust much more deeply into the U.S. market for material for private aircraft.

Toray has hitherto exported prepreg to the States with the supply volume concerned steadily expanding. The export, will be replaced by the new venture's output. The planned U.S. subsidiary will hire approximately 120 employees and its annual sales three years hence are put at ¥5 billion ($38 million). Toray already has a production base for prepreg at its Ehime factory in western Japan.

MAJOR SYNTHETIC FIBER MAKERS HIT BY ECONOMIC SLOWDOWN

Five major Japanese synthetic fiber makers were hit hard by the economic slowdown in fiscal 1991 ended March 31. Four out of the five makers posted drops in net and pretax profits on an unconsolidated basis because of a slump in demand for industrial-use fibers and resins from the auto and electric appliance industries.

The four companies are Asahi Chemical Industry, Toray Industries, Teijin, and Mitsubishi Rayon. Only Kuraray reported increased sales and profits as sales of artificial leather and special resins made up for the drop in sales of general-purpose resins. The four companies' sales of the fibers for clothing were generally brisk, but the business of non-fiber divisions, affected by the economic slowdown, eroded their earnings position. For the current business year ending next March 31, all the companies expect reduced profits and sales.

CAUSTIC SODA PRODUCTION BELOW 3,900,000 TONNE IN FY 91

Production of caustic soda in fiscal 1991 recorded 3,895,743 tons a[nd] deliveries including exports registere[d] 3,893,182 tons. Both showed a 1 p[er] cent decline from the preceding fisc[al] year. Until FY90 caustic-soda produ[c]tion continued to hit a record high f[or] four years straight, showing an averag[e] year-on-year increase of 4-5 per cen[t].

It, however, peaked last fiscal yea[r] due to the economic slowdown in Japa[n] and a decrease in chlorine consumptio[n] stemming from an environmental pollution problem. The operation rate dropped 2 percentage points from tha[t] of fiscal 1990 to 96 per cent in fisca[l] 1991. Exports decreased by 16.5 per cent to 300,000 tons from the 360,000 tons of fiscal 1990 when the past record high was set.

According to a supply-and-demand estimate for fiscal 1992 worked out by the Ministry of International Trade and Industry, production will record 3,880,000 tons, domestic demand will register 3,610,000 tons and exports will come to 270,000 tons. Almost all the figures are level with the previous fiscal year. The decrease in chlorine consumption will certainly decrease production. Many say, however, that there will be no sharp decline.

ETHYL-ACETATE CAPACITY EXPANDED TO 100,000 T/Y

Tokuyama Petrochemical Co. has expanded production capacity for ethyl acetate from 70,000-100,000 t/y at its Shin-Nanyo factory. The company has thus become the world's top supplier of the product.

The product has been in short supply in Japan over the past several years. Nippon Synthetic Chemical Industry Co. is scheduled to suspend operation of ethyl-acetate facilities at the end of this year. There is, therefore, anxiety about stable supply of the product. Japanese demand for ethyl acetate —mainly for use in paints and inks — is expected to show nearly the same

growth rate as the GNP. From a global point of view, overseas producers have been reluctant to build up capacity with stringent environmental regulations throughout the world in the background.

More than half of the company is owned by Showa Denko, who has boosted ethylene capacity at its Ohita factory to 730,000 t/y and enhanced related operations covering acetaldehyde, acetic acid and vinyl acetate. Tokuyama's capacity built-up coincides with the parent firm's project.

SULFURIC ACID DEMAND IN 1991 SETS RECORD

Japan's total demand for sulfuric acid in fiscal 1991 recorded 7,053,000 tons (up 1.8 per cent over previous year), setting an all-time high, and production registered 7,031,000 tons (up 1.3 per cent), the 2nd-largest figure ever. Production, however, could not quite reach the level of the past record high marked in 1973 and regarding domestic demand, the increase in industrial use failed to offset the decrease in fertiliser use. Although domestic demand slowed down, exports zoomed to 890,000 tons (up 21.8 per cent), attaining high growth as in the past.

The main export destination was Southeast Asia with application centered continuously on fertilisers. Sulfuric acid for fertiliser use has continued to decrease since 1989 up to the present. Industrial use, however, has maintained a high level, although the increase rate concerned is no longer high.

Supply and Demand for Sulfuric Acid in Fiscal 1991
(in 1,000 tons; %)

	FY91	FY91/FY90
Production		
Smelter gas	4,185	100.6
(Copper)	(2,890)	(99.7)
(Zinc)	(1,295)	(102.7)
Pyrites	542	104.0
Sulfur	2,035	102.0
Others	269	100.7
Total	7,031	101.3
Domestic demand		
Fertiliser use	1,291	97.2
(Ammonium sulfate)	(283)	(99.6)
(Phosphate fertiliser)	(1,008)	(96.6)
Industrial use	4,872	100.1
Sub-total	6,163	99.5
Exports	890	121.8
Total demand	7,053	101.8
Year-end inventories	215	—

Note: Exports are based on customs clearance statistics, but include estimates for March.
Source: Sulphuric Acid Association of Japan.

PRODUCTION BASE FOR EXPANDED PP TO BE COMPLETED IN U.S.

JSP Corp. — Japan's leading foamed-plastic maker — is due to complete in June a 120-t/y molding plant for automotive-use bumper cores based on "P-Block" expanded polypropylene on the plant site (Los Angeles, U.S.) of its U.S. subsidiary — J&V Foam Products Inc. The products will be supplied to U.S. auto makers from July. In connection with this, the Japanese company has began to build a 1,200 t/y expanded PP-beads plant on the same site with start-up slated for next January. The products will be aggressively marketed in the States and Mexico.

P-Block, developed by the company itself, has excellent thermal resistance, dimensional stability and shock-absorbing properties and can be recycled since it is not crosslinked in molecular structure. The product is being increasingly employed for car bumper cores. J&V Foam Products now produces foamed polystyrene sheet used in the form of food trays.

JSP Corp. established ARCO/JSP in Pittsburgh, the U.S. in 1985 in collaboration with Arco Chemical (U.S.): the joint company produces 2,000 t/y of PP beads, which are supplied to Japanese and U.S. car makers for use in bumper cores. Recently, however, the joint venture has not been able to completely meet demand for PP beads with brisk demand from the West Coast and Mexico in the background. ARCO/JSP Europe affiliated with JSP Corp. has competed a PP-beads plant in Belgium and put it into trial operation.

C.ITOH TO IMPORT NATURAL GAS FROM RUSSIA

C.Itoh & Co. will import 100,000 tons of gas condensate, worth about $10 million, from Russia. Gas condensate is a raw material used for production of gasoline and petrochemical products.

The supplier is Urengoy Gasprom, a state-run enterprise in Urengoy, western Siberia, the world's largest production center for natural gas. Urengoy produces about 24 billion cu.m./m of natural gas accounting for 40 per cent of Russia's total output of natural gas. Gasprom will use the money to buy computers and production equipment in Japan.

New Developments from Japan

NEW LOWER-COST CARBON FIBER FOR FRP TO BE MADE BY MITSUI MINING

Mitsui Mining Co. will complete in June a plant for carbon fiber to be used for fiber-reinforced plastic (FRP); the plant is being built on the site of its Kyushu research laboratory in Kita-Kyushu. This is part of the firm's plan to branch out into carbon-fiber business as a reinforcing material.

The carbon fiber is of a new type made mainly of an aromatic polycyclic compound and features much lower production cost than conventional equivalents made of PAN (polyacrylonitrile) or pitch. The new product has ductility of around 3 per cent. The firm is also constructing a semi commercial plant for carbon fiber for use in the carbon fiber-reinforced concrete (CFRC) developed together with Kajima Corp. The product is likely to be marketed in October.

The FRP-use carbon fiber has a smaller diameter so that it has tensile strength nearly twice that of the CFRC-use carbon fiber, has high surface activity and is quite wettable to plastics. The firm will thus have production facilities for both FRP- and CFRC-use carbon fiber by the fall. This is in line with the company's business strategy aiming at moving into advanced ceramics and specialty carbon-fiber products. It is already pushing operations for the advanced ceramics and alumina fiber it has developed by itself.

MITI TO SUPPORT DEVELOPMENT OF NEWER PAINTS, CFC ALTERNATIVES

The Ministry of International Trade and Industry (MITI) has decided to encourage development of advanced chemical products causing no harm to the environment. They include newer paints, detergents and oil-dispersing agents. This project will start next fiscal year beginning in April 1993. MITI will subsidise businesses tackling R&D for such chemicals and their manufacturing methods. Target paints are those using less solvent and producing less hydrocarbon to improve the working environment and protect the environment as well as antifouling paints for ship bottoms which will not contaminate the ocean.

Newer ship-bottom paints to replace conventional tin-based or cuprous oxide-based ones are likely candidates desirable from the viewpoint of environment protection. Replacements for the specific CFCs and 1-trichloroethane are other targets. MITI will also advocate development of an efficient oil-dispersing agent to promptly curb the spread of oil spilt in the sea as a result of tanker accidents, etc.

CARBON FIBER, PAN-FIBER HYBRIDIZED FOR PREPREG

Nippon Steel Chemical Co. has developed an elaborate-function prepreg in which pitch-source carbon fiber and PAN (polyacrylonitrile)-based fiber are hybridized. The prepreg has a high level of elasticity peculiar to pitch-source carbon fiber and also the high levels of tensile strength and compression strength that PAN-based fiber has.

The product has already been put through evaluation tests satisfactorily by Fujikura Rubber Ltd., and a leading golf-shaft maker. They have decided to employ the prepreg for some products. Nippon Steel Chemical will soon begin marketing the prepreg — which will be available in eight grades — for use in sports and leisure goods. In future the firm wants to sell the product for use as machine and equipment parts which require both high strength and elasticity.The new prepreg is also easy to process and features low production cost, the maker says. The firm, together with Nippon Steel Corp. as its parent company, has carried out R&D on pitch-source carbon fiber and prepregs for nearly 10 years. The former is operating a 40 t/y pilot plant for the carbon fiber at its Hirohata factory for R&D and to prepare for mass production.

The company has also built a prepreg plant with a capacity of 3 million m^2/y in Chiba. Pitch-source carbon fiber and PAN-based fiber have opposite characteristics; the former features a high level of elasticity but poor tensile strength and compression strength, while the latter has high levels of tensile strength and compression strength but is weak in terms of elasticity.

CLINICAL TRIALS ON LEAF-DERIVED ANTICANCER DRUG PLANNED FOR JAPAN

Rhone-Poulenc Rorer Japan Inc. (RPRJ) — Japanese subsidiary of Rhone-Poulenc Rorer Inc. (U.S.) — has contracted to develop/market a new-type anticancer drug (common name: taxotere) in collaboration with Chugai Pharmaceutical Co. RPRJ aims to speed up clinical trials on the new product by capitalising on Chugai's R&D capabilities.

The U.S. parent firm has already put the product into phase-II clinical test in the United States and Europe. The product was originally developed by Rhone-Poulenc SA (France) and a French research institute (CNRS). It is chemically synthesised from extract from the leaves of *Taxus brevifolia* (kind of Pacific yew tree), which grows in Canada and the States — Oregon and Washington States in particular.

The two firms are considering applying taxotere to the treatment of ovarian/uterine cancers. It has been confirmed that the product improved the condition of more than 40 per cent of the patients suffering from cancers at the final stage and those resistant against other anticancer drugs.

The agent causes no side effects. A CNRS official claims: "There has been no promising anticancer agent like taxotere over the past 20 years". Taxol extracted from the trunk of *Taxus brevifolia* was once put into clinical trials by National Cancer Institute.

The product proved to be considerably effective against uterine/lung cancers. Its feedstock supply was, however, limited since *Taxus brevifolia* grows only slowly and in limited areas. What is worse, the feedstock supply calls for cutting down the trees concerned, which runs counter to world-wide moves toward forest preservation.

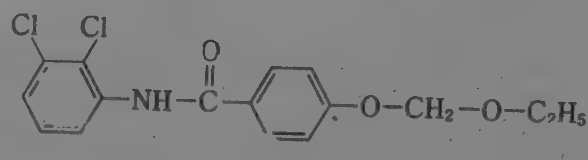
Taxotere can be obtained from extract from the leaves concerned and has higher water-solubility than taxol, thus serving as a far more effective anticancer agent.

NEW BARNYARD GRASS HERBICIDE HAS MINIMAL FISH TOXICITY

Hodogaya Chemical Co. is on the verge of developing a new environmentally friendly herbicide for paddy fields. The chemical will be the first barnyard grass-killing herbicide clearing the class D fish toxicity standard: meaning that harmful effects on fish are minimal.

The firm is considering supplying the chemical as a 1-shot herbicide in the form of either a ready-mixed or a straight (unmixed) chemical. The product (development code: "HW-52") now undergoing field tests on a contract basis proves to be highly adsorbed by soil and has a low level of water solubility, thereby causing minimal adverse effects on the water and creatures living in the water, the company claims.

The firm hopes to apply for registration of the chemical in Japan in the first half of 1994. HW-52 is highly effective specifically against barnyardgrass. Although it has no advantages over similar chemical in terms of application period and amount, it excels in environmental friendliness.



Molecular structure of "HW-52" herbicide

The firm is studying additional new application forms for the chemical, such as oil-flowable and ball forms, besides conventional granular form.

TONER CARRIERS DIRECTLY COATED WITH POLYETHYLENE

Idemitsu Kosan Co., together with Minolta Camera Co., has developed polyethylene-coated carriers for toner used in copying machines. The new products have high durability and help produce clearer pictures. In the new process concerned, ethylene is directly polymerised on the surface of fillers — with the help of high-activity catalysts. It is possible to freely control the content of the fillers and the molecular weight of the polyethylene.

The new carrier has an irregular shape, so its specific surface is so wide as to provide excellent toner-carrying capabilities. Conventional carriers have to date been produced by kneading base resin (acrylic or silicone resin) with filers and granulating the resultant product.

The new product is less expensive than existing ones. Minolta has begun to supply the new product in sample form. Idemitsu is considering applying the new technology to polymer-alloy production and embarking on toner business.

USED-PLASTIC COLLECTOR[S] GROWING DIFFICULTIES

"Reverse recovery" of waste pl[...] such as plastic trays and PET bottl[...] now in increasing difficulties becau[...] greater-than-expected costs and bur[...] shouldered by recoverers, i.e. pla[...] packaging wholesalers in many ca[...] They have been taking an active ro[...] collection of used plastic containers [...] food and beverages in Japan.

Reverse recovery means collectio[...] used plastic bottles and other food c[...]tainers in a direction opposite to [...] direction of their distribution, tha[...] from consumers and retailers to wh[...]salers to makers. In this practice, wh[...]salers have played a leading role, [...] they — most are small-sized busines[...] — are confronted with larger-th[...] expected expenses to undertake col[...]tion services; labor and transport c[...] are very far from being negligi[...] according to an industry observer.

Such expense is said to reach ¥[...] ($1.15) per kg of collected used plast[...] causing a significant burden on col[...]tors. Unless their services are prope[...] rewarded, the observer warns that th[...]sands of wholesalers conducting s[...] services may be brought into financ[...] trouble.

On the other hand, a plastic-t[...] maker complains that it needs to p[...] collectors ¥200-400 ($1.54-3.08) per [...] of used plastics as compensation for c[...]lection and transport, spend ¥200-4[...] per kg for sorting the collected produ[...] and ¥60 ($0.46) for their crushing/e[...]trusion into pellet form for recycli[...]

This makes the cost of recycled pl[...]tic products 2-3 times higher than t[...] of products made from virgin resin. T[...] maker contends that if the collected p[...]ducts it receives exceed 20 per cent [...] its total production, its ordinary prof[...] will become nil.

MARKET INFORMATION

Butanol prices shoot

Prices of butanol shot up by Rs. 17 from Rs. 45 per kg. following acute shortage of the material. Prices of other chemicals also firmed up marginally. In the dyes intermediate section aceto acetic ester (methyl) eased with local supplies entering the market. Price of 1-phenyl 3-methyl-5-pyrazolone is expected to ease shortly. Dichlone (imp.) also went down by Rs. 15 to Rs. 385 per kg.

We cannot guarantee the accuracy of the prices published in CHEMICAL WEEKLY as they are based only on the enquiries made by our correspondent -- and, as such they are not FIRM PRICES as between a buyer and seller. The prices are published only with a view to giving some ideas of the market conditions.

The prices are inclusive of Excise and Maharashtra Sales Tax.

(Prices as on June 23, 1992)

INDUSTRIAL CHEMICALS	Per Kg.
Ammonium sulphate	3.25
Ammonium phosphate (Mono)	20.00
Ammonium phosphate (Di)	16.00
Ammonium carbonate (Di)	25.00
Ammonium bicarbonate	6.60
Ammonium chloride	5.00
Ammonium nitrate	6.50
Arsenic white powder	32.00
Acrylamide (Resale)	125.00
Adipic Acid	105.00
Barium carbonate	16.00
Bleaching powder (33% Cl)	6.00
Borax (Granular)	38.00
Borax (Powder)	42.00
Boric acid (Tech)	62.00
Bisphenol-A	95.00
Butyl carbitol	110.00
Caustic soda (Flakes)	17.00
Caustic soda (Solid)	17.00
Caustic soda (Lye)	15.00
Calcium chloride 70% (Solid)	3.25
Calcium chloride 75-80%(fused)	3.50
Calcium chloride 36% (Anhydrous)	5.00
Calcium carbonate (precipitated)	6.00
Calcium carbonate (Activated)	5.75
Cobalt oxide	550.00
Cresylic acid	85.00
Camphor (Indian)	125.00
Cream of Tartar (Tech.) China	70.00
Citric acid (Per 50 kg)	4,400.00
Copper sulphate	34.00
Chromic acid	77.00
Dimethyl formamide	85.00
Ethylene urea	90.00
Ferric chloride (Lumps)	10.00
Ferric chloride (Anhydrous)	15.00
Glue flakes	15.00
Glue sheets	6.75
Gohsenol GH-17 (Resale)	180.00

Hydro	60.00
Hyflosupercell	50.00
Hexamine (Resale)	32.00
Industrial Wax	27.00
Litharge	40.00
Lead Acetate (Tech.)	39.00
Lithopone (Czech.)	40.00
Magnesium chloride (Crystal)	3.00
Menthol crystal (Flakes)	360+Ex+ST
Menthol bold	425+Ex+ST
Menthol crystal cold	395+Ex+ST
Magnesium carbonate (Japan)	30.00
Magnesium carbonate (Indian)	26.00
Maleic Anhydride (Resale)	45.00
Mercury (34.5 Kgs)	8,500.00
Nickel chloride	110.00
Oxalic acid (Resale)	20.00
Peppermint oil (Rectified)	188+Ex+ST
Potassium carbonate (Indian)	48.00
Potassium carbonate (Imported)	47.00
Potassium bichromate	46.00
Potassium phosphate (Mono)	34.00
Potassium phosphate (Di)	25.00
Polyvinyl alcohol (No. 117)	150.00
Polyvinyl alcohol (No. 173)	190.00
Polyvinyl alcohol (No. 208)	200.00
Paraformaldehyde (Resale)	42.00
Phthalic anhydride (Resale)	41.00
Pentaerythritol (Resale)	68.00
Paraffin wax	30+ST
Rangolite (German)	120.00
Rangolite (Czech.)	120.00
Rangolite (China)	72+ST
Sodium sulphate (Fine)	8.00
Sodium sulphate (Coarse)	7.75
Sodium sulphide 50-52% (Flakes)	10.00
Sodium sulphide 58-60% (Flakes)	21.50
Sodium sulphide pure (Flakes)	12.25
Sodium nitrite (Resale) per 50 kg.	825.00
Sodium chlorite 80% (Spain)	90+ST
Soda Ash (Tata)	6.80
Soda Ash (Birla)	6.60
Sodium bicarbonate	9.00
Sodium bisulphite	8.00
Sodium silicate	5.50
Sodium acetate	8.00
Sodium alginate	300.00
Titanium Dioxide (Anatase)	80.00
Titanium Dioxide Anatase (China)	70.00+ST
Titanium Dioxide (Rutile -- R-902)	110.00
Tartaric acid	380.00
Trisodium phosphate	16.00
Thiourea	100+ST
Urea (Tech.)	3.00
Vacuum salt	1.00
Zinc Dust	52.00
Zinc Oxide (Resale)	70.00
Zinc chloride powder (Tech.)	20.50
Zinc sulphate	7.00

SOLVENTS	Per Kg.
Acetic Acid Glacial (Resale)	20.00
Acetic Anhydride (Resale)	36.00
Acetone (Resale)	30.00
Aceto Acetanilide	67.00
Aniline Oil (HOC)	68.00
Benzoate Plasticiser	62.00
Butyl Acrylate	90.00
Butyl stearate	38.00
Butanol	62.00
Benzyl Alcohol	60.00
Benzyl Chloride	34.
Benzo trichloride	16.
Benzoyl chloride	22.
Bromine Liquid	115.
Chloroform	65.
Carbon Tetrachloride	30.
Cellosolve	85.
Cyclohexanone	80.
Cyclohexanol	85+S
Diacetone (Resale)	29.
Diethyl Oxalate	34.
Diethyl glycol (DEG) (Resale)	42.
Dioctyl Phthalate	69.
Diallyl Phthalate	44.
Dimethyl Phthalate	48.
Dioctyl Adipate	58.
Dibutyl Adipate	42.
Dipentene	15.
Dimethylamine 40%	30.
Dimethylamine 50%	35.
Ethyl Acetate	27.
Ethyl Acrylate	92.
Ethylene Dichloride	21.
Ethylene Glycol	42.
Formic Acid (Imp.)	34.
Formaldehyde (Resale)	7.
Glycerine (CP)	70.
Glycerine (IW)	65.
Hydrogen Peroxide 50% (Resale)	46.
Isopropyl Alcohol	46.
Isobutyl Alcohol (Resale)	35.
Monoethanolamine (Resale)	95.
Melamine	67.
Methyl Ethyl Ketone	58.
Methyl Isobutyl Ketone	60.
Methyl Acrylate	72.
Methylene Dichloride (Resale)	30.

Meta Cresol	65.00
Nitrobenzene	23.00+ST
Nitric Acid (Conc.) (RCF)	2.50
Octanol	72.00
Ortho Cresol	30+ST
Phenol (Resale)	52.00
Propylene Glycol	68.00
Polyethylene Glycol (No.200)	52.00
Polyethylene Glycol (No.400)	84.00
Polyethylene Glycol (No.600)	75.00
Polyethylene Glycol (No.1600)	54.00
Polyethylene Glycol (No.4000)	100.00
Polyethylene Glycol (No.6000)	130.00
Para Cresol	120.00
Styrene Monomer	46.00
Stearic Acid	34.00
Sorbitol	25.00
Sulphuric Acid	2.80
Trichloroethylene	30.00
Triethanolamine (Resale)	100.00
Turpentine Oil (Germany)	8.00
Turkey Red Oil (50%)	20.00
Vinyl Acetate Monomer	52.00

SOLVENTS	Per Litre
Benzene	18.50
N-Heptane	15.00
N-Hexane	21.00
Methanol	11.25
Solvent Naphtha Heavy	10.50
Solvent Naphtha Light	8.50
Toluene	19.50
Xylene (Ortho)	32.00

DYES INTERMEDIATES (PRICES ARE WITHOUT TAX AND EXCISE)

Alphanaphthylamine	81.00
Alpha Naphthol (Imp.)	205.00
Aceto Acetic Ester (Methyl)	145.00
Acetanilide	60.00
Anthraquinone	155.00
Anthranilic Acid	108.00
2-Amino 4-Nitrophenol	155.00
Blue B. Base (Local)	330.00
Beta Naphthol	72.00
Benzidine Dihydrochloride (BDH)	94.00
Bromamine Acid (IDI)	700.00
BON Acid	125.00
CPC (Crude)	110.00
Chicago Acid (Atul)	360.00
Coach Acid	60.00
Cyanuric Chloride (German)	245.00
DEMAP	255.00
2,4-DNCB	28.00
Dichlone (Imp.)	385.00
Dimethyl Aniline	100.00
Diethyl Aniline	180.00
Diethyl Sulphate (Japan)	90.00
Diethyl Sulphate (Local)	75.00
Diamino stilbene disulphonic acid	215.00
3,3-DCB	260.00
Diphenylamine (U.K.)	160.00
Gamma Acid (Atul)	220.00
Gamma Acid (Local)	180.00
H. Acid (Atul)	170.00
G. Salt	76.00
J. Acid	360.00

K. Acid	123
MPDS (Local)	155
MNA	130
Meta Ureido Aniline	190
MPD (Local)	180
MPD (German)	200
N-Methyl J. Acid	530.
N-Methyl Aniline	130.
Naphthalene (Refined)	33.
Ortho Anisidine (OA) (Imp.)	102.
Ortho Dichloro Benzene (ODCB)	20.
OT Base	175.
OT Liquid	75.
Para Dichloro Benzene (PDCB)	32.
Para Anisidine (PA local)	150.0
PNA	78.0
Para Cresidine (Imp.)	340.0
Para Amino Azo Benzene (India)	140.0
PNCB (HOC)	40.0
Para Nitro Toluene (HCC)	95.0
1-Phenyl 3-Methyl 5-Pyrazolone	190.0
Phenyl J. Acid	421.0
PT Base	160.0
Rhoduline Acid	620.0
Resist Salt 80%	28.0
Resorcinol	350.0
Sodium Naphthionate	78.0
5-Sulpho-Anthranilic Acid	110.0
Sulphanilic Acid	44.0
Sulpho Tobias Acid	140.0
Tobias Acid (Imp.)	105.0
Metanilic Acid	51.0
MTD (German)	185.0
Vinyl Sulphone	122.0

Bombay Drugs Market

(Prices as on June 23, 1992)

Product	Rs./kg.
Adipic Acid	100
Aerosil	590
Aluminium Hydroxide IP	43
Ampicillin Sodium	4400
Ampicillin Trihydrate	3200
Aminophylline	360
Amitryptylline HCl	5300
Amoxycilline Trihydrate	3400
Albendazole	2700
Analgin	315
Aspirin IP	105
Atenolol	2500
Atropine Sulphate	22000
Benzoic Acid IP	29
Bromhexine HCl	2300
Bromine	110
Butylated Hydroxy Anisole	1450
Caffeine Citrate IP	430
Caffeine IP	421
Calcium Gluconate IP	90
Calcium Glycerophosphate	250
Calcium Lactate	30
Calcium D Pantothenate	1475
Cetrimide IP	235
Chlorbutol	220
Chlorpromazine HCl	2700
Chlorpropamide	235
Choline Chloride FG	39
Choline Chloride IP	80
Cloxacillin Sodium	3100
Cimetidine	3350
Citric Acid IP	90
C.P. Maleate	1175
Cyproheptadine HCl	29000
D-Panthenol	1850
Diclofenac Sodium	2350
Dicyclomine HCl	2100
Diethyl Carbamazine Citrate	620
Di-iodohydroxyquinoline	725
Diloxanide Furoate IP	490
Diphenhydramine HCl	350
Disodium Hydrogen Citrate	90
Dithranol	7500
Ephedrine HCl	1950
Ethambutol IP	1200
Ethophylline	560
Ethyl Oleate	180
Fenbendazole	2650
Ferrous Fumarate	48
Ferrous Gluconate	130
Folic Acid IP	3400
Furosemide IP	2100
Furazolidone IP	725
Glyceryl Glycol Ether	625
Griseofulvin	2100
Guanidine Nitrate	50
Gallic Acid	475
Hydrazine Hydrate	120
Hydroxylamine HCl	575
Hydroxylamine Sulphate	100
Ibuprofen IP	525
Imipramine HCl	5000
Indomethazine	1025
I.N.H.	375
Inositol IP	1350
Iodochloro Hydroxyquinoline	550

Product	Rs./kg.
Iodoform	550
Isopropamide iodide	14,500
Lactose IP	105
Lactic Acid (Japan)	165
Levamisole	1950
Lignocaine HCl	430
Lignocaine Base	430
Loperamide	3200
L. Lysine Feed Grade	160
L. Lysine Pharma Grade	250
Magnesium Hydroxide	35
Magnesium Trisilicate IP	17
Mannitol USP	275
Mebendazole IP	550
Mefenamic Acid Capsule	575
Mefenamic Acid Tablet	550
Menthol	325
Mephenesin	250
Mercurochrome NF	280
Methocarbamol	900
Methyl Nicotinate	600
Metochlopromide HCl	2000
Metronidazole IP	520
Metronidazole Benzoate	500
Morpholine	180
Neomycine Sulphate	4200
Niacin	300
Niacinamide	375
Nifedipine	1250
Nipagin Plain (Methyl Paraben)	180
Nipagin Sodium	190
Nipasol Plain	280
Nipasol Sodium (Propyl Paraben Sodium)	330
Nitrofurazole	850
Nitrofurantone	900
Norfloxacine	4900
Oxyphenbutazone	750
Papaverine HCl	2300
Paracetamol	140
Paraffin Liquid	58
Pectin IP	650
Pepsin 1:3000	1100
Pheniramine Maleate	1450
Phenyl Butazone IP/BP	360
Phenyl Butazone USP	325
Phenylpropylamide HCl	1850
Phthalyl Sulphathiazole	450
Piperazine Citrate	225
Piperazine Hexahydrate	180
Prochlorperazine Maleate	8700
Promethazine HCl	2850
Propranolol HCl	850
Propionic Acid	95
Pseudoephedrine HCl	2900
Pyrazinamide	2000
Pyremethamine	2300
Pyroxicam	2900
Ranitidine	2300
Saccharine Sodium	240
Salbutamol Sulphate	7000
Sodium Iodide	410
Sodium Methoxide	270
Sorbitol Powder	210
Sorbitol USP	23
Sulphadiazine	825
Sulphacetamide Sodium	370

Product	Rs./
Sulphadoxine	29
Sulphamethoxazole	3
Sulphasomidine	4
Sulphaphenazole	3
Terbutaline Sulphate	300
Tinidazole	4
Theophylline Anhydrous	4
Thiacetazone	3
Thoridazine HCl	200
Thycol (Potassium Gluconate Sulphate)	5
Tolbutamide	2
Trifluopromazine HCl	110
Trifluoperazine HCl	125
Trimethoprim IP	18
Tween 80	2
Vitamin B6 Hydrochloride	34
Vitamin B2 5-Phosphate	46
Vitamin K-3 (Water soluble)	7

EXPORT C.I.F. PRICES FOR BULK DRUGS FROM INDIA
(Prices in US$)

Ampicillin Trihydrate B.P.	78.00
Amoxycillin Trihydrate B.P.	76.00
Cephalexine B.P.	170.00
Chlorpropamide HCl	7.50
Chlorbutol B.P.	6.50
Chloramphenicol Powder B.P.	51.00
Chloramphenicol Palmitate	49.00
Chlorpheniramine Maleate B.P.	36.00
Dimetridazole	11.00
Ethambutol HCl B.P.	36.00
Erythromycin Stearate B.P.	65.00
Erythromycin Estolate B.P.	70.00
Erythromycin Base B.P.	85.00
Erythromycin Base USP	80.00
Furosemide B.P.	60.00
Ferrous Fumarate USP XXI	1.60
I.N.H.	8.25
Iodochlorohydoxyquinoline USP XXI	18.50
Ibuprofen B.P.	11.50
2-Methyl 5-Nitro Imidazole	7.50
Mebendazole USP XXI	22.00
Metochlopramide HCl	65.00
Nifedipine USP XXI	47.00
Niacinamide B.P.	7.75
Niacin B.P.	7.00
Ortho Nitro Benzaldehyde	48.00
Oxyphenbutazone B.P.	22.00
Pheniramine Maleate B.P.	45.00
Potassium Iodide B.P.	10.50
Phenolphthalein B.P./USP/ White	10.50
Pyrazinamide B.P.	36.00
Paracetamol B.P.	4.80
Pyroxicam USP XXI	95.00
Riboflavin Sodium Phosphate USP XXI	90.00
Salbutamol Sulphate B.P.	260.00
Sodum Iodide B.P.	13.00
Sulphamethoxazole	10.50
Tinidazole B.P.	14.00
Tolbutamide	8.00
Trimethoprim B.P.	32.00
Thiacetazone	13.00

Bombay Dyes Market

(Prices as on June 23, 1992)

ACID COLOURS	Per Kg.
Acid Violet 4BS	*190.00
Acid Maroon V	110.00
Acid Orange II	112.55
Acid Orange IIY	93.85
Acid Red A	137.00
Acid Scarlet 3R	128.35
Acid Red 38N	*195.00
Acid Red R2R	132.00
Acid Red RS	88.00
Acid Patent Blue AS	*280.00
Acid Green V	*375.00
Acid Coomasi Blue	200.00
Acid Yellow 5GN	65.00
Acid Red PG	85.00
Acid Red GRS	78.00
Acid Black 10 BX	157.15
Acid Black BX	126.95
Acid Black Wax	135.50
Crosein Scarlet MOO	200.30
Procinil Yellow GS (ICI, UK)	265.00
Procinil Red GS (ICI, UK)	530.00
Procinil Blue RS (ICI, UK)	315.00
Procinil Scarlet G (ICI, UK)	600.00
Procinil Orange G (ICI, UK)	250.00
Procinil Rubine (ICI, UK)	550.00

* To get resale price add 6% tax.

DIRECT COLOURS	Per Kg.
Yellow 3GX	114.00
Gun Yellow RCH	175.85
Fast Yellow GCH	171.50
Yellow CFG Hly. Conc.	721.00
Fast Yellow GS	126.96
Fast Yellow CHRS	116.85
Viscose Orange A	210.35
Fast Orange GR	171.50
Red	122.65
Dark Tan	98.15
Red IIR	98.15
Red 4B	217.55
Bordeaux BW	170.10
Fast Scarlet 4BS	223.50
Red 12B	220.45
Bordeaux Hly. Conc.	249.20
Cotton Red N	117.05
Brill. Fast Helio B	362.85
Brill. Fast Helio 2R	385.83
Brill. Fast Helio 2RS	177.30
Brill. Fast Helio BS	116.10
Brill. Violet Extra	181.45
Blue 2B	102.50
Blue G	220.45
Sky Blue FB	242.00
Copper Blue GR	190.25
Fast Greenish Blue GL	114.60
Developed Black BT	149.95
Blue NB-2B	348.45
Blue NB-2BG	214.70
Developed Black NB-GHB	214.70
Green B	142.75
Green NB-B	218.90
Green 2B-N	218.90
Brown MR	197.40
Brown CN	137.00
Golden Brown G	175.85
Catechin G	155.70
Omega Tan	161.45
Catechin GS	102.80
Black E Hly Conc.	180.15
Black E Extra Hly. Conc.	180.15
Black NB-ER Hly. Conc.	290.50

DISPERSOL COLOURS	Per Kg.
Red B 3B Conc.	611.50
Red B 2B Conc.	797.90
Red CB Powder	1048.25
Red D2B Powder	580.65
Violet C 4R	1202.70
Blue BG Powder	580.65
Blue BN Powder	128.25
Blue D 2R Powder	588.25
Navy BT Conc.	531.95
Blue B 2G Conc.	577.95
Blue BT Conc.	319.50
Blue BR	482.40
Yellow 7GL	813.20
Yellow 5RX	269.90
Yellow 3G	473.20
Yellow	140.00
Yellow AL	167.20
Yellow Brown REL	311.70
Yellow FFL	571.40
Gold Yellow GG	320.80
Pink REL	593.00
Red BEL	615.60
Red 2B	422.40
Red FB	425.80
Red Violet FBL	622.00
Orange 3R	254.20
Violet 3R	370.50
Violet RL	355.70
Violet 6R	638.20
Scarlet RR	283.50
Rubine 3B	289.10
Rubine CB	449.50
Blue GL	419.00
Blue BGF	805.80
Navy Blue RE	359.90
Brown 3REL	272.80
Black GEL	420.
Dark Brown 3B	411.

BASE COLOURS	Per K
Fast Yellow GC	77.7
Fast Orange GC	128.4
Fast Scarlet R	198.0
Fast Scarlet RC	128.4
Fast Scarlet RCR	105.6
Fast Scarlet G	115 7
Fast Scarlet GN	92.9
Fast Scarlet GG	77.7
Fast Scarlet GGS	73.9
Fast Red B	233.5
Fast Red RC	115.7
Fast Red R Flakes	158.8
Fast Red TR	181.6
Fast Red TR Oil	223.3
Fast Red RL	251.2
Fast Red KB Oil	251.2
Fast Bordeaux GP	236.0
Fast Garnet GBC	103.0
Fast Violet B	548.8
Fast Blue BB	566.5

NAPHTHOL COLOURS	Per Kg
ASG	301.85
AS	205.65
ASSW	379.10
ASBS	253.75
ASBO	266.40
ASD	209.45
ASOL	243.60
ASTR	369.00
ASPH	336.05
ASE	236.00
ASEL	249.95
ASLB	2,002.35
ASBT	2,459.45
ASWG	143.00
ASSG	538.65
ASSR	652.60

PROCION COLOURS	Per Kg.
Golden Yellow HR	207.95
Brill. Yellow H4G	145.65
Supra Yellow H-8GP	168.55
Brill. Yellow HE6G	214.75
Yellow G-E4R	276.05
Brill. Yellow H7G	332.30
Yellow M4R	275.45
Yellow M GR	387.65

Brill. Yellow M4G	201.15
Brill. Yellow M8G	366.10
Yellow M 3R	244.70
Brill. Orange H 2R	303.80
Brill. Red H 7B	157.95
Brill. Orange M 2R	313.15
Brill. Red H 8B	213.55
Brill. Scarlet H RN	245.05
Supra Red H-3BP	179.80
Brill. Red H-F3B	243.45
Brill. Magenta HB	182.00
Brill. Red M 5B	160.05
Brill. Red M 8B	218.35
Brill. Pink MB	137.10
Brill. Magenta MB	163.65
Brill. Purple H-3R	219.55
Brill. Purple H-7R	175.40
Navy Blue H 3R	333.75
Brill. Blue H-GR	406.40
Brill. Blue H 5G	207.95
Blue H 5RX	286.20
Brill. Blue H 7G	213.95
Brill. Blue H 7RX	358.15
Turquoise HA	265.05
Supra Blue H-3RP	595.30
Supra Turquoise H 2G P	181.50
Blue H-FRD	305.80
Navy Blue H ER	333.75
Blue H 5RX	286.20
Navy Blue M 3R	355.70
Brill. Blue MR	405.60
Brill. Blue M RX	214.20
Brill. Blue M-G	226.45
Blue M 4GD	369.40
Navy Blue M RB	341.85
Turquoise M-G	240.30
Brill. Blue M GX	516.25
Blue 3R Acra Powder	718.20
Dark Brown H 6R	248.45
Cobalt Oxide	285.00
Green H 4BD	287.00
Green H-E4BI	169.80
Red Brown H IF	143.25
Orange Brown H 28	209.05
Brown M GRN	188.80
Black H-N	314.20

SULPHUR COLOURS	Per Kg.
Navy Blue	210.35
Green G	194.55
Black Grains Extra	72.25
Black Grains OG	73.70
Black GXE Conc.	70.85
Black GXE	57.90
Black GXR	69.40
Black Grains 800	62.80
Black EXR Grains	73.70
Black EXR Grains 800	59.35

VAT COLOURS (ICI)	Per Kg.
Yellow 5G Supra Disperse	561.85
Yellow 5G Acra Con.	818.60
Gold Orange 3G Pdr. Fine	1158.45
Brill. Orange 6R Pdr. Fine	624.35
Gold Orange 3G Supra Disp.	693.85
Brill. Orange 6RX Powder	394.30
Brill. Red 3B Pdr. Fine	1214.15
Brill. Red 3B Supra Disp.	867.45
Brill. Purple 3R Acra Powder	827.05
Brill. Purple 2R Hly. Conc.	744.25
Brill. Purple 4R Supra Disp.	604.25
Brill. Purple 2R Acra Conc.	779.85
Blue 2R Pdr. Fine	675.30
Blue BC Acra Conc. Pdr. Fine	1013.15
Blue BC Conc. Pdr. Fine	713.65
Blue R Conc. Pdr. Fine	719.70
Blue Conc. Powder	645.80
Brill. Blue 2R Hly. Conc.	378.55
Blue RR Supra Powder	629.35
Brill. Blue 2R Supra Disp.	115.65
Dark Blue 2R Powder Fine	512.65
Blue BC Supra Disp.	419.65
Jade Green XBN Powder Fine	555.80
Jade Green XBN Acra Conc. Pdr.	1026.05
Jade Green 2G Pdr. Fine	533.25
Jade Green 2G Ptg. Paste	125.40
Jade Green XBN Ptg. Paste	126.00
Jade Green 2G Supra Disp.	618.00
Olive D Pdr. Fine	563.90
Olive Green B Supra Disp.	421.70
Jade Green XBN Supra Disp. (N)	327.30
Olive OMW Pdr. Fine	698.55
Olive OMW Supra Disp.	538.05
Olive D Supra Disp.	361.70
Olive R Supra Disp.	470.25
Olive D Ptg. Paste	193.00
Olive Green B Ptg. Paste	199.10
Olive Green B Acra Conc.	741.10
Olive R Acra Conc.	779.85
Brown R Pdr. Fine	869.45
Dark Brown 3R Fine	826.25
Brown G Supra Disp.	582.05
Brown 2G Supra Disp.	716.10
Brown R Supra Disp.	547.35
Brown BR Powder	867.75
Dark Brown 3R Ptg. Paste	217.15
Dark Brown 3R Supra Disp.	529.60
Brown G Acra Conc.	967.95
Brown M. Powder Fine	768.80
Grey M. Supra Disp.	585.45
Blue BC Acra Conc. Pdr. Fine	762.70
Direct Black AC Supra Disp.	415.75
Direct Black AC Pdr. Fine	574.70
Direct Black CH Supra Disp.	490.45
Direct ACD Ptg. Paste	217.15

Delhi Market

DELHI: JUNE 19 (NNS) An easy-to-firm tendency was noticed in the local chemical market during the week under review. Though cultivation of menthol in U.P. was reported better, yet due to paucity of rains, plant development was not up to the desired level. Consequently, on better buying support from stockists menthol medium and bold quality registered a spurt of Rs. 20/25 at Rs. 280 and Rs. 295 per kg. respectively. Similarly, menthol flake and thin quality shot up to Rs. 265 and Rs. 275 from Rs. 242 and Rs. 255 per kg. respectively. June-July delivery contract also moved up to Rs. 262 per kg. against Rs. 240 per kg. Spot price for menthol oil was quoted higher by Rs. 10 at Rs. 180 per kg. and June-July delivery also shot up by Rs. 10 at Rs. 175 per kg.

If the export demand is on the rise, menthol prices would further escalate. DMO ended the week with a gain of Rs. 5 at Rs. 70 per kg. With the onset of monsoon in Bombay, heavy offerings were made by the stockists coupled with discouraging Bombay advices. Borax granular and crystal suffered a sharp setback of Rs. 50/75 at Rs. 1600 and Rs. 1850 per 50 kg. respectively. Likewise, boric acid technical (Morarji) slumped by Rs. 150 at Rs. 2650 per 50 kg. On good offerings from Bombay coupled with discouraging Bombay advices, citric acid drifted lower by Rs. 200 at Rs. 4000 per 50 kg. Despite paucity of ready stock, citric acid Bombay Dyeing slumped by Rs. 50 at Rs. 4700 per 50 kg. Due to poor offtake, caustic soda flakes was down by Rs. 20 at Rs. 790/800 per 50 kg. Following offerings by the stockists due to tight money market conditions, titanium dioxide K. Brand and TTP lost Rs. 3 and both were quoted at Rs. 70 per kg. while RC-822 titanium remained stable at Rs. 95 per kg. On scattered support, paraffin wax showed a gain of Rs. 15 at Rs. 1140 per 50 kg. while slack and match wax remained firm at Rs. 12,600 and Rs. 18,000 per tonne respectively. Residue wax remained subdued at Rs. 8000 per tonne due to slack support.

(DELHI MARKET RATES AS ON JUNE 19, 1992)

Ammonia Bicarb (Per 25 Kg.)	170.00
Mercury (Per flask)	7,900.00
Soda ash (Per bag)	470/485.00
Ammonium Chloride (50 Kg.)	200/230.00
Caustic soda flakes (50 Kg.)	790/800.00
Citric acid (Per 50 Kg.)	4,000/4,700.00
Stable Bleaching Powder Shriram (Per 25 Kg.)	142.00
Stable Bleaching Powder KCl (Per 25 Kg.)	135.00
Stable Bleaching Powder Maruti (Per 25 Kg.)	128.00
Stable Bleaching Powder Modi (Per 25 Kg.)	135.00
Sodium Bicarbonate (50 Kg.)	410/420.00
Sod. Hydrosulphite (Per Kg.)	55.50/64.00
Rangolite (Per Kg.)	120.00
Safolite (Per Kg.)	74.00
Chatkolite (Per Kg.)	72.00
Decolite (Per Kg.)	96.00
DMO (per Kg.)	70.00
Boric acid Technical (Per 50 Kg.)	2,650.00
Paraffin Wax (Per 50 Kg.)	1,140.00
Slack wax (Per metric tonne)	12,600.00
Tartaric Acid (France Per Kg.)	484.00
Borax Granular (Per 50 Kg.)	1,600.00
Borax Crystal (Per 50 Kg.)	1,850.00
Sodium Nitrite (Per 50 Kg.)	750/850.00
Sodium Nitrate (Per 50 Kg.)	530.00
Camphor Thal (Per Kg.)	138.00
Camphor Powder (Per Kg.)	122.00
Menthol Bold (Per Kg.)	295.00
Menthol Medium (Per Kg.)	280.00
Menthol Flake (Per Kg.)	265.00
Menthol Flake June (Per Kg.)	230.00
Menthol Oil (Per Kg.)	180.00
Glycerine (Per Kg.)	65.00/70.00
Sodium Silicate (Per quintal)	350/450.00
Hexamine (Per Kg.)	33.00
Acetic Acid Glacial (Per Kg.)	16.50
Copper Sulphate (Per quintal)	4,000/4,400.00
Formic Acid (Per Kg.)	34.00/40.00
Formaldehyde (Per Kg.)	10.00
Hydrogen Peroxide (Per Kg.)	44.00/46.00
Calcium Carbonate (Per Tonne)	2,800/6,200
Acid Slurry Soft (Per Kg.)	38.00/50.00
Acid Slurry Hard (Per Kg.)	42.00
Phosphoric Acid (Per 50 Kg.)	1,630.00
Potassium Nitrate (Per quintal)	1,500/1,700.00
Potassium Permanganate (Per 50 Kg.)	3,700/4,600.00
Sodium Bichromate (Per 50 Kg.)	1,600.00/1,700.00
Trisodium Phosphate (per 50 Kg.)	750.00
Titanium Dioxide Anatase T.T.P. (Per Kg.)	70.00
Titanium Dioxide RC-822 (Per Kg.)	95.00
Titanium Dioxide Anatase K-Brand (Per Kg.)	70.00
Titanium Dioxide RCR-2 (Per Kg.)	N.A.
Zinc Oxide (Per Kg.)	58.00/66.00
Phenol Carbolic Acid (Per Kg.)	48.00
Carbon Tetrachloride (Per Kg.)	32.00
Chloroform (Per Kg.)	30.00
Sodium Sulphate (Per metric tonne)	6,600.00
Naphthalene Balls (Per 50 Kg.)	2,075.00
Match Wax (Per tonne)	18,000.00
Residue Wax	8,000.00

DYES & COLOURS	(Per Kg.)
Naphthol AS	175/206.50
Naphthol ASG	300/318.70
Naphthol ASBS	250/305.00
Naphthol ASTR	350/464.58
Naphthol ASOL	200/241.40
Naphthol ASBO	260/321.20

DIRECT DYES	(Per Kg.)
Black E. Conc.	135/240.50
Diazo Black B.T.	115/214.76
Green B	100/194.74
Blue 2-B	70/140.39
Blue 2-B 225% (JNR)	135.00
Sky Blue FB	160/362.07
Basic Auramine	55/125.00
Basic Rhodamine	340/500.00
Basic Methylene Blue	100/220.00
Basic Violet	190/250.00
Basic Malachite Green	250.00
Acid Orange	90/150.39
Congo Red H/C	95/170.41

Madras Market

Trading was subdued. There has been no change in prices over the last week. PVA powder prices have come down on better availability. Solvent supply position continued to be bad and prices of some solvents like IPA, NBA, PEGs are ruling high.

(MADRAS MARKET RATES AS ON JUNE 20, 1992)

INORGANIC CHEMICALS

Aluminium Sulphate Iron free (per kg)	4.00
Ammonium Bicarbonate (per kg)	7.00
Ammonium Bifluoride (per kg)	45.00
Ammonium Chloride (per kg)	4.00
Ammonium Nitrate (per kg)	8.00
Barium Carbonate (per kg)	18.00
Barium Chloride (per kg)	16.00
Bleaching Powder (per kg)	6.00
Borax (per kg)	32.00
Boric Acid (per kg)	64.00
Calcium Chloride Solid (per kg)	4.50
Calcium Chloride Anhydrous (per kg)	7.00
Calcium Carbonate (Activated) (per kg)	9.00
Calcium Carbonate (Precipitated) (per kg)	8.50
Caustic Soda Flakes (per kg)	16.00
Chromic Acid (per kg)	74.00
Copper Sulphate (per kg)	39.00
Ferric Chloride (Lumps) (per kg)	11.00
Ferric Chloride (Anhydrous) (per kg)	16.00
Ferrous Sulphate Crystal (per kg)	5.50
Hydros (TCPL) (per kg)	57.00
Hydros (IDI) (per kg)	62.00
Hydrogen Peroxide (per kg)	43.00
Hyflosupercell (per kg)	48.00
Litharge (per kg)	40.00
Lead Acetate (per kg)	40.00
Magnesium Carbonate (per kg)	32.00
Magnesium Chloride (per kg)	5.00
Magnesium Sulphate (per kg)	4.00
Mercury (per 34.5 kgs)	8,600.00
Nickel Chloride (per kg)	195.00
Nickel Sulphate (per kg)	195.00
Phosphoric Acid (per kg)	38.00
Potassium Carbonate (per kg)	45.00
Potassium Dichromate (per kg)	54.00
Potassium Hydroxide (per kg)	46.00
Soda Ash (TAC) (per 75 kgs)	525.00
Soda Ash (TATA) (per 75 kgs)	525.00
Soda Bicarbonate (per 50 kgs)	450.00
Sodium Cyanide (per kg)	90.00
Sodium Fluoride (per Kg)	30.00
Sodium Nitrite (per kg)	18.00
Sodium Nitrate (per kg)	10.00
Sodium Sulphite (per kg)	16.00
Sodium Bisulphite (per kg)	12.00
Sodium Sulphate (Anhydrous) (per kg)	6.00
Sodium Silicate (per kg)	5.50
Sodium Sulphide (per kg)	16.00
Sodium Hexameta Phosphate (per kg)	27.00
Sodium Tripolyphosphate (per kg)	29.00
Trisodium Phosphate (per kg)	15.00
Titanium Dioxide (Anatase) (per kg)	77.00
Titanium Dioxide (Rutile) (per kg)	106.00
Zinc Chloride (per kg)	22.00
Zinc Oxide (per kg)	66.00
Zinc Sulphate (per kg)	16.00

ORGANIC CHEMICALS

Acetic Anhydride (per kg)	36.0
Acetic Acid (per kg)	23.0
Acid Slurry (per kg)	37.0
Benzoic Acid (per kg)	45.0
Citric Acid (per kg)	85.0
Formaldehyde (per kg)	11.0
Glycerine I.W. (per kg)	67.0
Glue Flakes (per kg)	18.0
Hexamine (per kg)	36.0
Maleic Anhydride (per kg)	48.0
Menthol Crystals (per kg)	400.0
Oxalic Acid (per kg)	18.0
Pentaerythritol (per kg)	70.00
Phenol (per kg)	54.00
Polyvinyl Alcohol Powder (per kg)	190.00
Phthalic Anhydride (per kg)	44.00
Sodium Acetate (per kg)	14.00
Sodium Alginate (per kg)	250.00
Sorbitol (per kg)	27.00
Urea (Technical) (per kg)	4.00

SOLVENTS

Acetone -- HOCL (per kg)	35.00
Benzene (per litre)	24.00
Butanol (per kg)	70.00
Butyl Acetate (per kg)	58.00
Carbon Tetra Chloride (per kg)	28.00
Cellosolve (per kg)	80.00
Chloroform (per kg)	35.00
Diacetone Alcohol (per kg)	46.00
Diethylene Glycol (per kg)	42.00
Di-butyl Phthalate (per kg)	76.00
Di-octyl Phthalate (per kg)	72.00
Ethyl Acetate (per kg)	28.00
Isopropyl Alcohol (per kg)	50.00
Methanol (per kg)	14.00
Methylene Chloride (per kg)	30.00
Methyl Ethyl Ketone (per kg)	66.00
Methyl Isobutyl Ketone (per kg)	58.00
Octanol (per kg)	80.00
PEG 400 (per kg)	75.00
Perchloroethylene (per kg)	40.00
Propylene Glycol (per kg)	67.00
Trichloroethylene (per kg)	32.00
Trichloroethane (per kg)	37.50
Toluene (per kg)	26.00
Xylene (per kg)	35.00

OVERSEAS TRADE OPPORTUNITIES

OVERSEAS SUPPLY OFFERS

Sulphuric acid

L. Gutierrez S.A. de C.V., 7 Ave. Norte 344, P.O. Box: 01-155, San Salvador, Salvador. Tel.: 503-711148; Fax: 503-213135; Telex: 20695.

Magnesium oxide (caustic and refractory grade)

Quimica del Mar S.A. de C.V., Rio de La Plata No. 48, Cuauhtemoc, 06500 Mexico, D.F., Mexico. Tel.: 5-2868133, 5-2863555; Fax: 5-2865327; Telex: 177-2487 SQ ME.

Red oxide (red and yellow)

Pigmentos y Oxidos S.A., Ave. Industrial Poniente No. 1200, Belavista, 64410 Monterrey, N.L., Mexico. Tel.: 83-311696; Fax: 83-313172; Telex: 382655 PYUM ME.

Potassium iodide

Raw Materials Inc., Attention: Teofilo Suarez H. Departamento Comercial, Calle Manuel Maria Icaza No. 15, Ave. Samuel Lewis, P.O. Box: 4493, Panama 5, Panama. Tel.: 635333.

Sodium bisulphite

Especialidades Qumicas Venoco S.A., Attention: 45-7126, Carretera Araguita, Guacara, Estado Carabodo, Venezuela. Tel.: 45-718133, 45-712699; Fax: 45-712815. Telex: 41275.

Sodium sulphate

Qumica Central de Mexico S.A. de C.V., Carretera Leon-San Francisco del Rincon Kmt. 13.5, San Francisco del Rincon, Guanajuato, Mexico. Tel.: 471-30022, 471-67866; Fax: 47-31130; Telex: 120541.

Zinc sulphate/acetic acid

Inversiones Quimicas Ltda., Attention: Alvaro Portilla C., Gerente, Carrera 58 No. 75-57, P.O. Box. 50011, Barranquilla, Colombia. Tel.: 5758-561864.

Potassium sulphate

Especialidades Qumicas Industriales S.A. de C.V., Ave. Bosques del Valle, No. 106-B, Piso 2°, Bosques del Valle, 66250 Garza Garcia, N.L., Mexico. Tel.: 83-355196, 83-356217; Fax: 83-568-304.

Calcium carbonate

Molinos del Norte S.A. de C.V., Padre Mier 134 Ote 64000 Monterrey, N.L., Mexico. Tel.: 83-425775, 83-426155; Fax: 83-426150; Telex: 83-425759.

Stearic acid

Mavesa S.A., Ave. Principal de Los Cortijos de Lourdes, Edf. Mavesa, P.O. Box: 2048, Caracas 1010-A, Estado de Miranda, Venezuela. Tel.: 2-2381633, 2-2037418; Fax: 2-351266; Telex: 25203 MAVEX VC.

Oleic acid (commercial olein), acidity: 0.3% max; melting point: 15°C-17° C; minimum order: 10 mt)

Oleaginosa del Pacifico S.A., Olpasa, Attention: Carlos Chirinos Q. Carlos Gonzalez 275, Ofc. 305 Maranga, San Miguel, Lima, Peru. Tel.: 5114-521730; Fax: 5114-521730; Telex: 20300 SMGL PE.

Ionomere cements for dental filling

Proquident Ltda., Calle 48C Sur No. 43A-249, P.O. Box: 066358, Medellin, Antioquia, Colombia. Tel.: 4-2886066, 4-2886077; Fax: 4-2884999.

Activated coal, granular, packed in kraft paper bags (5 layers) and inner polyethylene protection; weight: 24kg./bag

Koexport Indis International, Ave. Diego de Almagro 2247, P.O. Box: 4912 CCL, Quito, Ecuador. Tel: 5932-521619; Fax: 5932-504571.

Polyethylene (low density)

Unitrade Import & Export GmbH, Perthalergasse 21/9, A-6020, Innsbruck, Austria. Tel.: 743-512295560; Fax: 743-512295561.

Polypropylene; plasticized polyvinyl chloride

Meh International Corporation, 149, West 28th Street, New York, NY 10001, United States. Tel.: 121-5637860, 317-8392317; Fax: 212-6295192.

PVC Compounds

Dispersiones Plasticas S.A., Attention: Carlos Cuevas, Director, Dr. Guestavo Baz No. 47-E, Xocoyahaulco, P.O. Box: 54080, Mexico, D.F., Mexico. Tel.: 5-5624220; Fax: 5-5629935.

Resins

Qumicas Stahl Polyvinyl C.A., Attention: Eduardo Salinas, Zona Ind. Valle Abajo, P.O. Box: 196, Cagua, Estado, Aragua, Venezuela. Tel.: 044-74044; Fax: 044-75053; Telex: 43359.

Carboxy methyl cellulose

Quimica Amtex S.A. de C.V., Palmas No. 415, Lomas de Chapultepec, 11000 Mexico, D.F., Mexico. Tel.: 5-2023011; Fax: 5-5205069; Telex: 1771767 QASA ME.

EXPORT OPPORTUNITIES

Kaolin

Ceramica Dominguez del Noroeste S.A., C/ Alcalde Saniz de Baranda, 1, 28009 Madrid, Spain. Tel: 91-2736271.

Petroleum wax

Amalie Petroquimica S.A., C/ Principe de Vergara, 128 28002 Madrid

Spain. Tel.: 91-5644769; Fax: 91-564-4417; Telex: 46332 LSLM.

Magnesium sulphate

Becamo S.A., Paseo Habana 141, 28036 Madrid, Spain. Tel.: 91-4594562; Fax: 91-4588696; Telex: 42189 JCARD E.

Acetic Acid

Intercontinental Quimica S.A., Paseo de La Castellana, 141, 28046 Madrid, Spain. Tel.: 91-2792704; Fax: 91-571-1334; Telex: 23517 INQUI E.

Propionic acid

Especialidades Quimicas Industriales S.A. de C.V., Ave. Bosques del Valle, No. 106-B, Piso 2°, Bosques del Valle, 66250 Garza Garcia, N.L., Mexico. Tel.: 83-355196, 83-356217; Fax: 83-568-304.

Paints

Moldey S.A. C.V., Ave. Diego Diaz de Berlanga No. 301, Ind. Nogalar, 66480 San Nicolasde Los Garza, N.L., Mexico. Tel.: 83-505388; Fax: 83-505-445; Telex: 383228 PIGA ME.

Polyethylene

Condutrade Internacional S.A. de C.V., Miguel de Cervantes Saavedra No. 255, Ampliacion Granada 11520 Mexico, D.F., Mexico. Tel.: 5-2505077, 5-2505300; Fax: 5-2509151.

Polypropylene resins

Aislantes Leon S.A. de C.V., Ave. Gustavo Diaz Ordaz, Carr. Monterrey-Saltillo Kmt. 333, Sec. In. Leona 66200 Garza Garcia, N.L., Mexico. Tel.: 83-360036, 83-361036; Fax: 83-361-644; Telex: 382209 ALSA ME.

Espigas y Plasticos del Norte S.A. de C.V., Joaquin Garza Leal No. 125, 67450, Cadereyta Jimenzez, N.L., Mexico. Tel.: 828-42099, 828-42874; Fax: 828-43127.

Montoi S.A. de C.V., Ave. Fidel Velazquez No. 509, 66350 Santa C arina, N.L., Mexico. Tel.: 83-362 83-363999; Fax: 83-363684; Te 383271 MONT ME.

Polyurethane

Espejos de Lara S.A., Juan A. de Fuente No. 56 Sur, Centro 27000 T reon, Coah, Mexico. Tel.: 17-1608 17-121967; Fax: 17-120262.

TENDER NOTICES

Name & Address of the party	Item/Services required	Quantity	Tender No.	Date of Opening
Oil & Natural Gas Commission, Attn: Dy. Director (MM), Palavasana, Mehsana, Gujarat. (Tender Fee: Rs. 50.00).	Toluene (LR grade sulphur free)	7.5 MT	MHN/SP/OBG/ MC/8/92-93	29.7.92
	Acetone (LR Grade)	350 Ltrs.	"	"
Punjab State Electricity Board, Attn: Superintending Engineer, TMR Circle, 15, Ajit Nagar, Patiala 147 001, Punjab. (Cost of specification Rs. 25.00)	D.B.P.C. anti-oxidant compound for transformer oil	150 Kg.	SE/TMR/P/NT-124/A 1992-93	14.7.92
Rashtriya Chemicals & Fert. Ltd., Attn: Chief Mtrls. Manager (P&S), Chembur, Bombay 400 074. (Last date for sale of tender form: 3.7.1992; Tender fee: Rs. 250.00)	Antifoaming agent (on Annual Rate Contract basis).	600 MT	DC/MG-80349	6.7.1992
Rashtriya Chemicals & Fert. Ltd., Attn: Materials Manager, Thal Unit, P.O. RCF Thal-402 208, Alibag Taluk, Raigad Dist., Maharashtra. (Earnest Money Deposit: Rs. 1,00,000).	Caustic soda lye on 100% basis	1200 MT (approx. 100 MT/month)	THAL/PUR/CSL/ AU/92	6.7.1992
OFFERS FOR SALE				
Lubrizol India Ltd. Attn: The Senior Manager (Purchase - Raw Materials) 9/3, Thane-Belapur Road, Turbhe, Thane 400 705.	Sodium hydrosulphide 25-30%	40 MT/month		3.7.92
	Hydrochloric acid 22-25%	200 "		
	Lean oleum 20%	30 "		
Tamil Nadu Newsprint & Papers Attn: Chief Manager (Stores & Transport), Kagithapuram 639 136, Tamil Nadu. (Tender fee Rs. 250.00; Last date for receipt of tenders - 28.7.1992).	Chemicals/dyes		188	31.7.92

Attention Subscriber !

We propose to include a new column on **"New Projects under implementation"** *in the forthcoming bumper annual number of CHEMICAL WEEKLY. Please send us details of your company's projects under implementation to be published* **free of cost** *in the Annual Number.*

Editor

SHIPPING NEWS

VESSELS DUE IN BOMBAY FOR EXPORT LOADING

Due Date (1)	Steamer's Name & Flag (2)	Agents (3)	Will load for (4)	Approx sailing d (5)
			BOMBAY PORT	
26/6	Stavronikos (V-4)	H.S.A.	Sharjah (Reefer only).	5/7
27/6	Admiral J	Preetika	Dubai	7/7
29/6	Makalu (Voy-716)	Greenways	Hamburg; Amsterdam; Thamesport; Rotterdam; Antwerp; Le Havre; Leixoes; Lisbon; Manchester; Avonmouth; Bremen; Belfast & all Destinations in U.K.; Germany; Switzerland; Austria and Scandinavian Ports. (Carting at CFS Cotton Avenue).	2/7
		Arebee/	P. Said; Alexandria; Piraeus; Venice; Trieste; Genoa; Koper; Naples; Fos; Marseilles; Barcelona; Valencia; Ravenna; Livorno; Las Palmas; Limmassol; Constanza; Budapest; Odessa; St. Petersburg (Russia). (Carting at M.O.D. No. 1).	
		M.C.S./	Genoa; Felixstowe; Hamburg; Rotterdam; Antwerp; Le Havre; Lisbon; Aarhus; Copenhagen; Gothenburg; Oslo; Budapest; Russia. (Carting at M.O.D. No. 2).	
		POL India/	Thames Port (London); Manchester; Liverpool; Birmingham; Hamburg; Bremen; Rotterdam; Antwerp; Le Havre; Gdynia; Gdansk; Aarhus; Oslo; Copenhagen; Helsinki; Malmao; Gothenburg; other Poland inland destinations; Genoa; Naples; Valencia; Izmir; Marseilles; Barcelona; Alexandria; Lattakia; Mersin; Dameitta; Beirut; Haifa; Ashdod. (Carting at T.P. No. 3).	
		J. Mackintosh/	Aqaba; Hodeida; Aden; P. Sudan; Djibouti. (Carting at F.B. No. 3).	
		P&O/	Tilbury; London; Felixstowe; Avonmouth; Manchester; Liverpool; Glasgow; Leeds; Birmingham; Dublin; Belfast; Bristol; Marseilles; Genoa; Barcelona; Le Havre; Antwerp; Rotterdam; Hamburg; Bremerhaven; Copenhagen; Oslo; Helsinki; Malmao; Gothenburg; Stockholm; Aarhus; Alborg. (Carting at T.P. No. 4).	
		Patvolk	Genoa; Marseilles; Le Havre; Antwerp; Rotterdam; Hamburg. (Carting at Timber Pond No. 4).	
5/7	Lanka Amila (V-23/W)	Seahorse	Felixstowe; London; Liverpool; Manchester; Avonmouth; Dublin; Wembly; Birmingham; Leeds and all inland destinations in U.K. & Cont.; Hamburg; Rotterdam; Antwerp; Oslo; Stockholm; Helsinki; Aarhus; Norkopping. (Carting at M.O.D. No. 3).	8/7
17/7	Tibor Szamuely (Rus) (Voy-128 W/B)	Transocean	Illyichevsk; Odessa; Izmail; Reni (USSR); Russe (Bulgaria); Galatz (Romania); Budapest (Hungary); Bratislava (Czechoslovakia); Pancevo; Belgrade/Beograde (Yugoslavia); Linz; Vienna (Austria); Deggendorff; Regensborg (Germany). (All ports on River Danube). (Carting at N/O- & G-PD).	18/7
3/7	Robert E Lee	M.S.P.L.	Assab. (Carting at P/Q-PD).	3/7
30/6	G. Lodowa	POL India	Colombo; Chittagong.	3/7
17/7	Tibor Szamuely	Transocean	Karachi (Afghanistan) (Carting at N/O-PD & G-PD).	18/7
29/6	Makalu (Pan) (Voy-710)	Greenways	New York; Newark; Baltimore; Charleston; New Orleans; Houston; Boston; Philadelphia; Norfolk; Savannah; Jacksonville; Wilmington; Miami; Montreal; Toronto; Los Angeles; Longbeach; San Francisco; Oakland; San Diego; Seattle; Richmond; Sacramento; Portland; Vancouver (B.C.); Tacoma; Chicago; Dallas; Various inland destinations. (Carting at CFS Cotton Avenue).	2/7
		Marine Trans/	South and Central American Ports. (Carting at E-Shed Grain Depot).	
		M.C.S./	Savannah; New York; Baltimore; Wilmington; Houston; Los Angeles; Longbeach; Boston; Norfolk; Charleston; Jacksonville; Miami; Oakland; New Orleans; San Francisco; S. American Ports. (Carting at M.O.D. No. 2).	

(1)	(2)	(3)	(4)	(5)
		Arebee/	Halifax; Montreal; Toronto; Los Angeles; Oakland; San Francisco; San Diego; New York; Baltimore; Boston; Charleston; Chicago; Dallas Houston; Jacksonville; Miami; Norfolk; Philadelphia; Savannah; San Juan; Tijuana; Veracruze; Mexico; Sao Francis do Sul; Carribbean; Central & South American Ports. (Carting at M.O.D. No. 1).	
		P&O	New York; Baltimore; Norfolk; Savannah; Charleston; Houston; & South American Ports. (Carting at T.P. No. 4 for P&O).	
27/6	Eagle Nova (Ger) (Voy-068)	F.F.C. Co.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver (B.C.); New York; Boston; Norfolk; Baltimore; Charleston; Savannah; Miami; New Orleans; Houston; Montreal; Chicago; Atlanta; Philadelphia; Milwaukee; Dallas; Guam; St. Louis; Wilmington (B.C.); San Diego; Indianapolis & Central American Ports; Honolulu. (Carting at Timber Pond No. 3).	1/7
1/7	Shenton (V-14 W/E)	Samrat	Longbeach; Oakland; Seattle; Los Angeles; San Francisco; Philadelphia; Savannah; Charleston; Baltimore; Norfolk; New York; Boston; Vancouver; Montreal; Toronto; New Orleans; Houston. (Carting at E-Shed Grain Depot).	3/7
24/6	Ocean Sincerity/ (V-46 A/B) (Mon)	O.S.A./	New York; Philadelphia; Baltimore; Houston; Boston; Chicago; Dallas; Atlanta; Savannah; Norfolk; Charleston; Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Toronto; Montreal; Portland; Tacoma; &	1/7
1/7	Ocean Centaurus (V-36 A/B)		S. American & W. Indies Ports. (Carting at B. Pier Extn.).	9/7
		Contfreight/	New York; Wilmington; Charleston; Baltimore; Savannah; Norfolk; Philadelphia; Los Angeles; San Francisco; Oakland; Seattle. (Only FCL). (Carting at Frere Basin).	
		U.L.A.	Los Angeles; San Francisco; Oakland; Seattle; Vancouver; Charleston; Houston; Norfolk; Baltimore; New York; Halifax; Montreal; Toronto; West Indies Ports. (Carting at E-Shed Grain Depot).	
3/7	Robert E Lee (USA) (Voy-65)	M.S.P.L.	Norfolk; New Orleans; Houston; Savannah; New York. (Carting at P/Q-PD).	3/7
1/7	Shenton (V-14 W/E)	Samrat/ Silvership	Brisbane; Sydney; Melbourne; Adelaide; Fremantle. (Carting at B-PD). Australian Ports. (Carting at F.B. No. 1).	3/7
24/6	Ocean Sincerity (Voy-46 A/B)	O.S.A./	Sydney; Melbourne; Auckland; Wellington; Lyttleton; P. Chalmers. (Carting at B. Pier Extn.).	1/7
		L. Triest/	Sydney; Melbourne; Adelaide; Brisbane. (Carting at Frere Basin No. 1).	
1/7	Ocean Centaurus (V-36 A/B)	Contfreight/	Melbourne; Sydney. (Carting at Frere Basin).	9/7
		U.L.A.	Fremantle; Sydney; Melbourne; Adelaide; Brisbane. (Carting at E-Grain Depot).	
7/7	Kota Cahaya (Voy-CAH-005)	J. Mackintosh/ Trident/	Brisbane; Sydney; Melbourne; Adelaide; Fremantle; Burnie; Auckland; Wellington; Lyttleton. (Carting at Frere Basin No. 2 for J. Mackintosh) (Carting at 12B-ID for Trident).	10/7
		Transworld/	Sydney; Melbourne; Adelaide; Fremantle; Burnie; Brisbane. (Carting at T.P. No. 3).	
		M.C.S.	Darwin. (Carting at M.O.D. No. 2).	
		Lucky Mari	Melbourne; Sydney; Brisbane. (Carting at F.B. No. 3).	
24/6	Ocean Sincerity	O.S.A.	P. Louis; Re Union; Tamatave. (Carting at B. Pier Extn.).	1/7
3/7	Pioner Belorussii		Lusaka; Ndola (Zambia); Lilongwe; Blantyre. (Carting at M.O.D. No. 2).	5/7
27/6	Leresti (V-005)	G.O.S.	P. Louis; Re Union; (Tamatave). (Carting at F.B. No. 1).	4/7
24/6	Ocean Sincerity (V-46 A/B)	O.S.A./	Lagos/Apapa; Abidjan; Lome; Douala; Cotonou; Tema. (Carting at B. Pier Extn.)	1/7
		U.L.A.	Lagos/Apapa; Abidjan; Lome; Matadi. (Carting at E-Grain Depot).	
6/7	Gold Hilla (V-71) (Pan)	Arebee	Lagos; Apapa; Abidjan; Tema (Direct); P. Harcourt; Takoradi; Lome; Cotonou; Douala. (Carting at M.O.D. No. 1).	10/7
29/6	Makalu (V-710)	Greenways	Singapore; Penang; Port Kelang; Bangkok; Djakarta; Surabaya; Manila; Cebu; Kaohisung; Keelung; Osaka; Yokohama; Kobe; Shimizu; Moji; Nagoya; Busan; Hongkong. (Carting at CFS Cotton Avenue).	2/7
27/6	Eagle Nova (V-068)	F.F.C. Co.	Penang; P. Kelang; Singapore; Bangkok; Jakarta; (T. Priok); Hongkong; Manila; Keelung; Kaohisung; Main Japan Ports; Tsingtao; Dairen; Quangzhou; Whampoa; Shanghai; Hsingkang. (Carting at T.P. No. 1).	1/7

(1)	(2)	(3)	(4)	(5)
1/7	Shenton (V-41 W/E) (Pan)	Samrat	Singapore (Direct); Penang; Jakarta; Surabaya; Belawan; P. Kelang; Bangkok; Manila; Hongkong; Kaohsiung; Keelung; Taichung; Busan; Yokohama; Nagoya; Kobe; Osaka; Tokyo; Haipong; Ho Chi Minh City. (Carting at E.G.D.)	3/7
		F.F.C. Co.	Singapore; Jakarta; Bangkok; Hongkong; Keelung; Busan; Kobe; Yokohama; Nagoya. (Carting at T.P. No. 1).	
24/6	Ocean Sincerity (V-46 A/B) (Mon)	O.S.A./	P. Kelang; Singpore; Kaohisung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Carting at B. Pier Extn.).	1/7
		M.S.P.L./	Singapore; Bangkok; P. Kelang; Penang; Jakarta; Ho Chi Minh; Surabaya. (Carting at F.B. No. 5 & 6)	
1/7	Ocean Centaurus (V-36 A/B)	Contfreight/	P. Kelang; Singapore; Kahsiung; Hongkong; Bangkok; Keelung; Jakarta; Busan; Main Japan Ports. (Only FCL). (Carting at Frere Basin).	9/7
		U.L.A.	Singapore; Penang; P. Kelang; Keelung; Kaohsiung; Bangkok; Busan; Jakarta; Hongkong; Japan and Chinese Ports. (Crtg. at E-Grain Depot).	
7/7	Kota Cahaya (V-CAH-005) (Sing)	J. Mackintosh/	Singapore; P. Kelang; Penang; Jakarta; Surabaya; Semarang; Belawan; Kaohsiung; Keelung; Bangkok; Hongkong; Manila; Busan; Ulan Battar; Yokohama; Nagoya; Kobe; Ho Chi Minh; Main Chinese Ports. (Carting at Frere Basin No. 2).	10/7
		Trident/	Busan; Hongkong; Keelung; Kobe; Nagoya; Yokohama; Penang; P. Kelang; Bangkok; Kaohsiung; Singapore. (Carting at 12B-ID).	
		E.S.P.L./	Vietnam; Japan and Chinese Ports. (Carting at E-Shed Grain Depot).	
		Silvership/	Far East Ports. (Carting at F.B. No. 1).	
		Beacon/	Far East Main Japan & Chinese Ports. (Carting at E-Shed Grain Depot).	
		Lucky Mari	Singapore; Penang; P. Kelang; Bangkok; Manila; Surabaya; Jakarta; Hongkong; Kobe; Yokohama; Nagoya; Kaohsiung; Keelung; Busan & Chinese Ports. (Carting at F.B. No. 3).	
3/7	Robert E Lee	M.S.P.L.	Singapore; P. Kelang. (Carting at P/Q-PD).	3/7

VESSELS DUE FOR IMPORT DISCHARGE

Due Date	Steamer's Name	Agents	From
	BOMBAY PORT		
7/7	Kota Cahaya (V-CAH-005)	J. Mackintosh/Trident/E.S.P.L./ Lucky Mari	Far East/Red Sea/East Africa
5/7	Hoegh Cairn	Patvolk	U.S./Canada/Mexico/Jeddah
3/7	Robert E Lee (V-65)	M.S.P.L.	U.S.A.
1/7	S/o. Orissa	S.C.I.	U.K. Cont.
4/7	S/o. Gujarat	S.C.I.	U.K. Cont.
1/7	Ocean Centaurus (V-36 A/B)	M.S.P.L.	
2/7	Vishva Ajay	S.C.I.	U.K. Cont.

Materials Imported/Exported

(Import values are c.i.f. port; Export values are f.o.b. port)

DRUG MATERIALS IMPORTED BOMBAY (4.5.92)

INDOMETHACIN BP: From China: Privi Pharma P. Ltd., 500 Kgs., Rs. 2,51,391.

MEGLUMINE BP: From France: Rhone-Poulenc India Ltd., 150 Kgs., Rs. 71,462.

SALICYLAZO SULPHAPYRIDINE: From Switzerland: Wallace Pharmaceuticals Ltd., 500 Kgs., Rs. 13,23,722.

PLASTIC MATERIALS IMPORTED (4.5.92)

HDPE: From Brazil: Gujarat Metal Cast P. Ltd., 10 Mts., Rs. 2,14,422; From Canada: Polychroic Industries, 10 Mts., Rs. 2,00,953; From Korea: A-1 Arts, 16 Mts., Rs. 3,46,400; Bombay Synthetics P. Ltd., 96 Mts., Rs. 20,98,698; Gujarat Packaging, 16 Mts., Rs. 3,56,796; Jewel Polymers, 16 Mts., Rs. 3,61,852; Kosmo Packers, 16 Mts., Rs. 3,52,256; Vishal Commercial Corpn., 16 Mts., Rs. 3,37,708; From Saudi Arabia: Nilkamal Crates and Containers, 33 Mts., Rs. 7,54,642; Plas Barrels India P. Ltd., 17,150 Kgs., Rs. 4,12,289; From USA: Pushpa Impex P. Ltd., 35 Mts., Rs. 7,00,330; Subhash Corporation, 17.500 Mts., Rs. 3,52,945; Vishal Plastics, 17.500 Mts., Rs. 3,33,491; From Yugoslavia: Addis Corporation, 9 Mts., Rs. 2,23,855; Bombay Ampoules P. Ltd., 20 Mts., Rs. 4,97,500; Cello Plast, 25 Mts., Rs. 6,21,230; Kalpesh Plastic Industries, 9 Mts., Rs. 2,23,539; Polychroic Industries, 20 Mts., Rs. 4,96,892; Progressive Trading Co., 10 Mts., Rs. 2,48,512; Wimco Pen Co., 25 Mts., Rs. 6,21,230.

LDPE: From Belgium: Essel Packaging Ltd., 48,000 Kgs., Rs. 13,72,076; From USA: Vishal Plastomer P. Ltd., 17 Mts., Rs. 2,61,870; From Yugoslavia: D.S. Mehta and Co., 45 Mts., Rs. 10,60,660.

LLDPE: From Singapore: Universal Cables Ltd., 32 Mts., Rs. 9,14,717.

POLYETHYLENE: From Sweden: Torrent Cables Ltd., 42,000 Kgs., Rs. 16,17,853.

POLYPROPYLENE: From Brazil: Metro Dyechem Ltd., 15,000 Kgs., Rs. 3,01,669; From France: Prudential Polywebs P. Ltd., 66 Mts., Rs. 14,32,756; From Italy: Parenteral Drugs (I) Ltd., 15 Mts., Rs. 4,33,537; From Korea: Dev Plastics, 15.500 Mts., Rs. 3,67,146; From Yugoslavia: Ruby Products, 15,500 Kgs., Rs. 3,75,058; Yotana Machine Tools P. Ltd., 8 Mts., Rs. 1,93,764; Yotana Wood Fab (P) Ltd., 7,500 Mts., Rs. 1,81,654.

POLYSTYRENE: From Korea: Powertech International, 17 Mts., Rs. 4,11,589.

PVC RESIN: From Brazil: Rekan Extrusions P. Ltd., 25 Mts., Rs. 4,22,109.

STYRENE MONOMER: From Australia: Fibrebond Industries, 7.600 Mts., Rs. 1,83,451; Hi-tech Industries, 7.600 Mts., Rs. 1,83,451.

MATERIALS IMPORTED BOMBAY (From 5.5.92 To 7.5.92)

ACRYLAMIDE PARASULPHONIC ACID: From USA: Pasupati Acrylon Ltd., 32 Mts., Rs. 38,02,437.

ADIPIC ACID: From Japan: Jadavji & Co., 8,500 Kgs., Rs. 3,02,365.

ALDEHYDE C-9: From Netherlands: Fine Fragments Ltd., 700 Kgs., Rs. 694.

ALDEHYDE C-9: From Switzerland: Industrial Perfumes Ltd., 25 Kgs., Rs. 17,989.

ALDEHYDE C-10: From Netherlands: Fine Fragrances Ltd., 13 kgs., Rs. 4,424; From Switzerland: Industrial Perfumes Ltd., 50 Kgs., Rs. 24,337.

ALDHYDE C-11: From Germany: Hindustan Lever Ltd., 50 Kgs., Rs. 42,847.

ALDEHYDE C-12: From Netherlands: Fine Fragrances Ltd., 17.5 Kgs., Rs. 15,665.

ALLYL AMYL GLYCOLATE: From Netherlands: Fine Fragrances Ltd., 4 Kgs., Rs. 4,735.

ALLYLCYCLOHEXYL PROPIONATE: From Netherlands: Fine Fragrances Ltd., 40 Kgs., Rs. 33,143.

ALPHA-PHENYLGLYCERINE CHLORIDE HYDROCHLORIDE: From Netherlands: Gujarat Lyka Organics Ltd., 5,775 Kgs., Rs. 46,32,687.

ALUMINIUM OXIDE: From USA: Grindwell Norton Ltd., 4,490 Kgs., Rs 3,26,661.

2-AMINO-3-BROMO-5-NITRO BENZONITRILE 98%: From Japan Sandoz (I) Ltd., 700 Kgs., Rs 4,08,526.

AMINOCAPROIC ACID USP: From Japan: Meghdoot Chemicals P Ltd., 50 Kgs., Rs. 44,955.

ANTIOXIDANT: From Italy: Polychem Ltd., 6 Mts., Rs. 9,94,755.

ARSENIC TRIOXIDE 99% MIN.: From China: Amar International, 40 Mts., Rs. 4,76,415.

BENZALDEHYDE 2-SULPHONIC ACID: From Japan: Nelikon Dyestuffs, 18 Kgs., Rs. 2,14,580.

BISPHENOL-A: From Japan: Synthetics & Polymer Inds., 16,000 Kgs., Rs. 5,23,421.

BUTYL ACRYLATE MONOMER: From Japan: New Synth Chem Inds., 28,800 Kgs., Rs. 8,51,772; Shah Chhanganlal Laxmichand, 14,400 Kgs., Rs. 4,74,624.

CAPROLACTAM: From Belgium: The Baroda Rayon Corpn. Ltd., 112 Mts., Rs. 56,91,572; From Netherlands: The Baroda Rayon Corpn. Ltd., 216 Mts., Rs. 1,09,76,604; JCT Ltd., 72 Mts., Rs. 36,58,868.

CARBAMATE: From USA: Gujarat Agro Inds. Corpn. Ltd., 40,000 Kgs., Rs. 55,64,528.

CARBON BLACK: From Germany: Western India Chemical Co., 840 Kgs., Rs. 1,19,527.

CARBON DIOXIDE: From UK: Electronics Corpn. of India Ltd., 5 Ltrs., Rs. 6,891.

CELLULOSE ACETATE: From USA: Interplex India P. Ltd., 4.082 Mts., Rs. 2,28,181.

CIANNAMIC ALCOHOL: From Switzerland: Industrial Perfumes Ltd., 200 Kgs., Rs. 57,140.

CITRIC ACID MONO 99.5% MIN: From China: Atic Exports, 20,000 Kgs., Rs. 5,84,739.

CITRONELLYL PROPIONATE: From Netherlands: Fine Fragrances Ltd., 15 Kgs., Rs. 6,102.

CYCLAMEN ALDEHYDE: From Switzerland: Industrial Perfumes Ltd., 190 Kgs., Rs. 1,50,786.

CYCLOHEXANONE: From Italy: Sudarshan Chemical Inds., 57,760 Kgs., Rs. 17,88,652; From Netherlands: Prakash Inds. Ltd., 34.080 Mts., Rs. 10,60,767.

D (-) ALPHA PHENYL GLYCINE CHLORIDE: From Netherlands: PCI Fine Chemicals P. Ltd., 525 Kgs., Rs. 3,78,175.

DESMODUR: From Germany: Alliance Boards Ltd., 18 Mts., Rs. 9,43,302; Goodlass Nerolac Paints Ltd., 1,020 Kgs., Rs. 2,68,705.

DICUMYL PEROXIDE: From Japan: Lakhani Rubber Udyog Ltd., 4 Mts., Rs. 45,39,937.

DICYANDIAMINE 99%: From China: Unichem Enterprises, 20 Mts., Rs. 8,28 111.

DIETHANOLAMINE: From Japan: Diamond Dye Chem Bombay P. Ltd., 14.910 Mts., Rs. 4,35,672.

DIETHYL SULPHATE: From Japan: Henkel Chemicals India Ltd., 2,990 Kgs., Rs. 1,75,923.

DIHYDROMYRCENOL: From Netherlands: Fine Fragrances Ltd., 60 Kgs., Rs. 23,081.

DIMETHYL ACETAMIDE: From Germany: Gujarat Lyka Organics Ltd., 4,180 Kgs. Rs. 2,17,529; J.K. Synthetics Ltd., 30,400 Kgs., Rs. 15,97,014.

DIMETHYL BENZYL CARBINYL ACETATE: From Switzerland: Industrial Perfumes Ltd., 25 Kgs., Rs. 16,930.

DIMETHYL CARBONATE: From France: Ganesh Medicament P. Ltd., 15,600 Kgs., Rs. 8,83,804.

DIMETHYL FORMAMIDE: From Germany: Gupta Trading Co., 14,820 Kgs., Rs. 4,61,284; Leo Petrochemicals, 14,820 Kgs., Rs. 4,61,284.

DIPHENYL METHANE DI ISOCYANATE: From Germany: Cello Plast, 6,000 Kgs., Rs. 3,04,905; Wimco Pen Co., 6,000 Kgs., Rs. 3,04,905.

DL MALIC ACID: From Japan: Pioma Inds., 35 Mts., Rs. 16,25,767.

EPICHLOROHYDRIN: From Germany: Hindustan Ciba Geigy Ltd., 16,560 Kgs., Rs. 6,94,270.

EPICHLOROHYDRIN 98%: From Japan: Kantilal Manilal & Co. P. Ltd., 16,320 Kgs., Rs. 6,68,658.

ETHOXY METHYLENE DIETHYL MALONATE: From France: Bayer India Ltd., 3,960 Kgs., Rs. 16,72,788.

ETHYL ACETOACETATE: From USA: Lupin Labs. Ltd., 15,048 Kgs., Rs. 7,15,222.

ETHYL CYANOACETATE: From Japan: Apuraj Chemicals P. Ltd., 1,000 Kgs., Rs. 1,80,156.

ETHYLENE VINYL ACETATE: From Belgium: Indian Petrochemicals Corpn., 48 Mts., Rs. 20,63,258.

2 ETHYL HEXANOIC ACID: From Germany: Aryavart Chemicals Ltd., 14.430 Mts., Rs. 5,13,309; WBF Inds. Ltd., 1,110 Kgs., Rs. 64,032.

FISCHER'S BASE (96%): From Korea: Keton Dyes, 1,041.7 Kgs., Rs. 3,33,491.

GAMMA DECALACTONE: From Netherlands: Fine Fragrances Ltd., 3 Kgs., Rs. 2,929.

GLUCOAMYLASE: From USA: Advanced Biochemicals P. Ltd., 1,600 Ltrs., Rs. 2,56,629.

GLYCERINE CRUDE: From Egypt: Godrej Soaps Ltd., 200 Mts., Rs. 31,30,804.

GUM BENZOIN: From Indonesia: Mehta & Sons, 3,912 Kgs., Rs. 35,560.

GUM MORYA: From Somalia: Mahima Enterprises, 8,280 Kgs., Rs. 91,991.

GUM ROSIN: From China: Sudarshan Chemicals Inds. Ltd., 17,100 Kgs., Rs. 5,90,636.

GUM ROSIN WG: From Indonesia: Resins & Plastics Ltd., 38.400 Mts., Rs. 6,03,713.

GUM TURPENTINE: From China: Camphor & Allied Products Ltd., 154 Mts., Rs. 35,69 078.

HEPTACHLOR TECH 72%: From USA: Pesticides India Ltd., 15,840 Lbs., Rs. 17,30,894.

HERBACET: From Netherlands: Fine Fragrances Ltd., 30 Kgs., Rs. 27,742.

HEXYLENE GLYCOL: From Italy: Pittie Exports P. Ltd., 8,550 Kgs., Rs. 3,53,024.

HEXYLSALICYLATE: From Netherlands: Fine Fragrances Ltd., 200 Kgs., Rs. 30,627.

HYDROXY ETHYL CELLULOSE: From Netherlands: Asian Paints I Ltd., 3,000 Kgs., Rs. 5,00,235.

IODINE CRUDE: From Channel Islands: Lub-Chem, 1,500 Kgs., Rs. 4,48,148; From Germany: Pharma Chem Labs., 1,000 Kgs., Rs. 3,06,494; From Japan: Prachi Pharmls. P. Ltd., 2,000 Kgs., Rs. 6,03,339.

INDIGO BLUE POWDER: From China: Arvind Exports, 550 Kgs., Rs. 1,20,533.

ISOBUTYL BENZENE: From China: BDH Pharmaceuticals Ltd., 5,780 Kgs., Rs. 4,79,170.

ISOOCTANE: From USA: Reliance Industries Ltd., 49,931 Kgs., Rs. 13,79,702.

ISOPHORONE: From Italy: Pittie Exports P. Ltd., 6,650 Kgs., Rs. 2,85,134; From Japan: Kantilal Manilal & Co. P. Ltd., 2,850 Kgs., Rs. 1,26,726.

ISOPHORONE DIISOCYANATE: From Germany: Resins & Plastics Ltd., 600 Kgs., Rs. 1,89,789.

LILIAL: From Switzerland: Industrial Perfumes Ltd., 190 Kg Rs. 1,08,566.

LITHOPONE: From Hong Kon Deluxe Sales Corpn., 60 Mts., R 4,61,376.

MANGANESE DIOXIDE: Fro Belgium: Cosmo Ferrites Ltd., 8.24 Mts., Rs. 5,65,501.

MERCENYLACETATE: From Netherlands: Fine Fragrances Ltd., 4 Kgs., Rs. 41,280.

METHACRYLIC ACID: From France: Pidilite Inds. Ltd., 13,440 Kgs Rs. 7,68,363.

METHYL BETA NAPHTHYL KETONE: From Switzerland: Industria Perfumes Ltd., 40 Kgs., Rs. 44,865.

METHYL CHAVICOL: From Netherlands: Fine Fragrances Ltd., 8 Kgs. Rs. 31,721.

METHYLNONYLACETALDEHYDE: From Netherlands: Fine Fragrances Ltd., 6 Kgs., Rs. 6,558.

MICROWAX: From Spain: Devchand & Co., 21,000 Kgs., Rs 5,56,929.

NAPHTHALENE: From Australia Atul Products Ltd., 1,55,480 Kgs., Rs 19,50,590; From Canada: Maparna Chem Inds. P. Ltd., 12,000 Kgs., Rs 1,79,132; May Chem Inds. P. Ltd., 600 Mts., Rs. 53,740.

NAPHTHALENE CRUDE: From Denmark: Ankit International, 65,980 Kgs., Rs. 9,01,104; International Dyestuff Industries, 66,180 Kgs., Rs. 9,24,855; Jupiter Dyechem P. Ltd., 147.630 Mts., Rs. 20,92,774; From Egypt: Siddharth Colorchem P. Ltd., 28,890 Kgs., Rs. 4,12,909.

NATROSOL HYDROXY ETHYL CELLULOSE: From Netherlands: Asian Paints I Ltd., 2,000 Kgs., Rs. 3,33,490.

OCTOIC ACID: From Germany: Brij Chemicals P. Ltd., 7.215 Mts., Rs. 2,46,258; Oxide and Chemical Inds., 7.215 Mts., Rs. 2,46,258.

OLEO PINE RESIN: From China: Dujodwala Resins and Terpenes, 304 Mts., Rs. 51,65,611.

ORTHOCHLORO TOLUENE TECH: From Italy: Dipak Laboratories P. Ltd., 1,980 Kgs., Rs. 72,339.

PARAFORMALDEHYDE: From USA: Unimark Chemicals, 6,800 Kgs., Rs. 1,07,987.

PARAMETHYL QUINOLENE: From Switzerland: Industrial Perfumes Ltd., 10 Kgs., Rs. 34,072.

PARA TERTIARY BUTYL PHENOL: From Korea: IVP Ltd., 12,000 Kgs., Rs. 4,87,849.

PHENYL ACETALDEHYDE 50%: From Switzerland: Industrial Perfumes Ltd., 200 Kgs., Rs. 1,07,931.

PHENYL ACETALHDEHYDE DIMETHYL ACETAL: From Switzerland: Industrial Perfumes Ltd., 50 Kgs., Rs. 36,506.

POLYPROPYLENE GLYCOL: From Germany: Cibatul Ltd., 3,000 Kgs., Rs. 2,48,053.

POLYVINYL ALCOHOL: From Japan: Ashwabharati Chemicals, 10 Mts., Rs. 5,71,698.

POLYVINYL PYRROLIDONE: From Germany: Sol Pharmls. Ltd., 200 Kgs., Rs. 94,222.

POTASSIUM CARBONATE 99%: From France: Navin Fluorine Inds., 19,200 Kgs., Rs. 4,17,721.

POTASSIUM SORBATE: From Germany: E. Merck Ltd., 300 Kgs., Rs. 73,654.

SODIUM LAURYL SULPHATE: From Japan: Gujarat Nylons Ltd., 5,940 Kgs., Rs. 5,15,197.

SULPHUR INSOLUBLE: From Germany: Metazinc (India) Ltd., 24,800 Kgs., Rs. 14,30,633.

TARTARIC ACID: From France: Enshell Chemical Inds., 5,000 Kgs., Rs. 5,38,214.

TEREPHTHALIC ACID: From UK: ICI India Ltd., 560 Mts., Rs. 94,26,667.

TETRABUTYL TITANATE: From Germany: Century Enka Ltd., 200 Kgs., Rs. 36,649.

TETRAHYDROMYGUOL: From Netherlands: Fine Fragrances Ltd., 45 Kgs., Rs. 19,974.

TITANIUM DIOXIDE: From USA: Indian Trading Corpn., 16,000 Kgs., Rs. 8,19,433.

TRICYCLODECANDEMETHYLOL: From Germany: Hindustan Lever Ltd., 180 Kgs., Rs. 82,910.

TRI-ETHYLENE GLYCOL: From Saudi Arabia: Oil & Natural Gas Commission, 368 Mts., Rs. 1,35,57,416.

TRIMELLITIC ANHYDRIDE: From USA: Acropolymers P. Ltd., 4,000 Kgs., Rs. 3,39,208.

TRIMETHYLOL PROPANE: From USA: Unimark Chemicals, 12,500 Kgs., Rs. 5,95,519.

TRIPHENYL PHOSPHINE: From Germany: Hindustan Ciba Geigy Ltd., 400 Kgs., Rs. 2,19,210.

TRI 2 HYDROXY ETHYL ISOCYANURATE: From Japan: Dr. Beck & Co. I Ltd., 17,000 Kgs., Rs. 14,79,248.

VANILLIN: From Japan: Indian Drugs & Pharmaceuticals Ltd., 30,000 Kgs., Rs. 97,25,926.

DRUG MATERIALS IMPORTED BOMBAY (From 5.5.92 To 7.5.92)

ALBENDAZOLE 99%: From China: Mulji Mehta & Sons P. Ltd., 250 Kgs., Rs. 2,66,178.

CHLORZOXAZOLE: From Japan: Ethnor Ltd., 400 Kgs., Rs. 3,04,906.

2 CYANOPYRAZINE: From Japan: Orgo Pharm Chemicals, 1,600 Kgs., Rs. 15,25,036.

DI CALCIUM PANTOTHENATE: From Japan: Indian Veterinary Pharma, 1,000 Kgs., Rs. 1,92,240; From UK: Tide Industries, 70.1 Mts., Rs. 1,07,183.

D PANTHENOL USP: From Germany: E. Merck (India) Ltd., 200 Kgs., s. 1,47,877.

IMIDAZOLE: From Japan: Mahavir hemical Inds., 300 Kgs., Rs. 1,02,905.

L-LYSINE: From Thailand: Avet hemicals P. Ltd., 3,000 Kgs., Rs. 34,395.

MANNITOL USP 21/BP 80: From ngapore: S. Kushalchand & Co., 000 Kgs., Rs. 5,16,091.

NEOMYCIN SULPHATE BP 80: rom China: Bharvi Pharmls., 151 Kgs., s. 1,73,368.

PRIMAQUINE PHOSPHATE IP/B-USP: From Hong Kong: Indian Drugs Pharmls. Ltd., 150 Kgs., Rs. 75,995.

SULPHADOXINE BP: From China: nglo French Drug Co. Ltd., 200 Kgs., s. 2,37,255.

SULPHADOXINE BP 88: From hina: Neviso Pharmaceuticals, 200 gs., Rs. 2,48,371.

SULPHATHIAZOLE BP 88: From China: Pure Drugs (India), 2,000 Kgs., Rs. 4,15,882.

PLASTIC MATERIALS IMPORTED BOMBAY (From 5.5.92 To 7.5.92)

HDPE: From China: Ashoka Polywares, 17 Mts., Rs. 3,80,094; Mahal Chand Motilal Kothari Co., 8 Mts., Rs. 1,63,785; From Germany: Ador Poly Containers Ltd., 16 Mts., Rs. 5,14,085; From Japan: Hukam Chand and Sons, 16.5 Mts., Rs. 3,25,747; Sanghavi Brothers, 16.5 Mts., Rs. 3,25,751; From Korea: Bina Corpn., 32 Mts., Rs. 7,23,451; Chetan Inds., 16 Mts., Rs. 3,53,729; Dynamic Packaging, 16 Mts., Rs. 3,82,976; Gujarat Packaging, 64 Mts., Rs. 14,27,184; Hico Enterprises, 16 Mts., Rs. 3,49,000; International Polymers, 48 Mts., Rs. 8,57,391; Kamdar Impex, 24 Mts., Rs. 5,65,524; K. Raheja Mercantile Corpn., 96 Mts., Rs. 21,09,252; Lakshman Plastic P. Ltd., 16 Mts., Rs. 3,82,114; L.P. Gas Equipments P. Ltd., 96 Mts., Rs. 22,45,092; Mahalchand Motilal Kothari Co., 8 Mts., Rs. 1,63,785; Manav International, 16 Mts., Rs. 3,47,234; Milan Inds., 16 Mts., Rs. 3,62,751; Narmada Extrusion P. Ltd., 16 Mts., Rs. 3,67,437; Pannalal Banarsidas, 96 Mts., Rs. 19,87,470; Polyset Plastics Ltd., 112 Mts., Rs. 24,96,543; Primo Pick N Pick P. Ltd., 32 Mts., Rs. 7,40,006; Prince Marketing, 16 Mts., Rs. 3,52,336; Ridhi Synthetic Traders Ltd., 48 Mts., Rs. 9,82,110; Riviera Polymers P. Ltd., 16 Mts., Rs. 3,72,916; Saraf Impex, 48,000 Kgs., Rs. 10,62,768; Saphire Chemicals, 32,000 Kgs., Rs. 7,41,550; Shah Patel and Co., 16 Mts., Rs. 3,55,722; Sidharth International, 30 Mts., Rs. 6,47,676; Sushil Chemicals, 32 Mts., Rs. 7,13,624; Vishal Commercial Corpn., 16 Mts., Rs. 3,37,710; From Saudi Arabia: Advance Plastics, 48 Mts., Rs. 10,57,983; Ahoti Techno Plast P. Ltd., 33 Mts., Rs. 7,46,964; Ami Pyroflex P. Ltd., 17.150 Mts., Rs. 4,19,420; Bright Brothers Ltd., 34.300 Mts., Rs. 7,40,794; Ellora Chemicals Works, 17.150 Mts., Rs. 4,13,973; Sirigiri Plastic Inds., 17.150 Mts., Rs. 4,03,079; Wadhwa Poly Films P. Ltd., 17.150 Mts., Rs. 4,19,420; From Singapore: Blow Pack, 17 Mts., Rs. 3,63,572; Chemstar Organics (India) P. Ltd., 17 Mts., Rs. 4,02,530; Saraogi Polybarrels P. Ltd., 17 Mts., Rs. 4,06,209; From Spain: Ishwar Arts, 32 Mts., Rs. 6,71,954; From Thailand: Impex P. Ltd., 17 Mts., Rs. 3,88,470; Synpacks, 17 Mts., Rs. 3,80,105; From USA: Ador Poly Containers Ltd., 2.525 Mts., Rs. 9,04,898; Avantika Plastochem P. Ltd., 33,100 Kgs., Rs. 7,46,416; Bijal Trading, 35,500 Mts., Rs. 7,58,776; Govindlal Alok Kumar Trading, 54 Mts., Rs. 10,29,057; Klowin Polymers Ltd., 17 Mts., Rs. 3,66,169; K. Raheja Mercantile Corpn., 66.181 Mts., Rs. 14,08,318; Manish International, 17.750 Mts., Rs. 3,79,552; Mukut Plastics P. Ltd., 16.783 Mts., Rs. 3,57,140; Subhash Corpn.,

17.500 Mts., Rs. 3,52,945; 50.349 Mts., Rs. 10,39,437; Transworld Polymers P. Ltd., 34 Mts., Rs. 7,36,555; Vishal Plastomer P. Ltd., 17.500 Mts., Rs. 3,33,491; From Yugoslavia: Addis Corporation, 32 Mts., Rs. 7,95,929; Associated Plastic Inds., 10 Mts., Rs. 2,48,472; B.M. Plastochem, 10 Mts., Rs. 2,48,584; Cello Thermoware P. Ltd., 20 Mts., Rs. 4,96,992; Kalpesh Plastic Inds., 5 Mts., Rs. 1,24,188; Polychroic Industries, 15 Mts., Rs. 3,72,669; Sadhuram & Co., 10,000 Kgs., Rs. 2,48,376.

LDPE: From Canada: Polychroic Inds. 25 Mts., Rs. 4,68,315; From Germay: Core Parentarals Ltd., 240 Mts., Rs. 78,96,048; From Japan: TPI India Ltd., 32.575 Mts., Rs. 5,47,812; From USA: Vishal Plastomer P. Ltd., 17 Mts., Rs. 2,61,870; From Yugoslavia: Dimple Overseas Ltd., 9 Mts., Rs. 2,15,112; Interplast Inds., 50 Mts., Rs. 12,38,195; Modi Plastics Ltd., 100 Mts., Rs. 23,80,286; Raj Packagings Inds. P. Ltd., 15 Mts., Rs. 3,60,549; Shah Patel & Co., 20 Mts., Rs. 4,74,608; Steel Trading Corpn., 52 Mts., Rs. 12,28,484.

LLDPE: From Netherlands: The Supreme Inds. Ltd., 60 Mts., Rs. 16,38,868.

POLYETHYLENE: From Canada: D.S. Mehta & Co., 23.400 Mts., Rs. 3,86,467; From Germany: Albert David Ltd., 32 Mts., Rs. 11,12,906; From Korea: Shreeji Enterprises, 32 Mts., Rs. 7,03,316; From Thailand: Daniel Philips and Co. P. Ltd., 34 Mts., Rs. 7,59,486; From USA: KLJ Plastics Ltd., 51 Mts., Rs. 12,19,976; From Yugoslavia: Addis Corpn., 36 Mts., Rs. 8,60,980; Associated Plastic Inds., 25 Mts., Rs. 5,89,420; Dimple Overseas Ltd., 95 Mts., Rs. 22,48,957; Interplast Inds., 9 Mts., Rs. 2,14,941; Iveon Lab., 32,000 Kgs., Rs. 10,80,383.

POLYPROPYLENE: From Australia: Parasrampuria Synthetic Ltd., 97.5 Mts., Rs. 23,01,102; From Brazil: Ishwar Arts, 10 Mts., Rs. 1,91,344; Ishwar Ashish Plastics P. Ltd., 10 Mts., Rs. 1,91,344; Pan Asia Inds. Ltd., 30 Mts., Rs. 6,01,131; Panorama Plastics, 10 Mts., Rs. 1,91,344; Vikram Plastics, 10 Mts., Rs. 1,91,344; From Korea: Chemiplas Inds., 31,000 Kgs., Rs. 6,84,210; Gupta Plastic Udyog, 30 Mts., Rs. 6,80,228; Hico Enterprises, 8 Mts., Rs. 1,70,827; 87.5 Mts., Rs. 16,54,885; Polydyne Corporation, 15.5 Mts., Rs. 3,66,053; Sandeep Enterprises, 15.500 Mts., Rs. 3,60,566; Saraf Impex, 31 Mts., Rs. 6,81,416; Swati Growth Fund Ltd., 16 Mts., Rs. 3,57,060; Vee Pee and Associated P. Ltd., 15.5 Mts., Rs. 3,35,789; From Singapore: Diamond Polyprints, 32 Mts., Rs. 7,28,738; J.K. Synthetics Ltd., 250 Kgs., Rs. 8,957; From USA: Chlorine Inds. Ltd., 35 Mts., Rs. 10,67,170; From USA: Cosmo Films Ltd., 102 Mts., Rs. 26,05,512; From Yugoslavia: Balaji Enterprises, 15.500 Mts., Rs. 3,75,485; Caprihans India Ltd., 31 Mts., Rs. 7,50,920; Cello Plast, 15.500 Mts., Rs. 3,75,282; Con Amore Thermoplastic P. Ltd., 15.5 Mts., Rs. 3,75,958; Progressive Trading Co., 31 Mts., Rs. 7,50,108; Samir Sales Corpn., 15.500 Mts., Rs. 3,75,440, S.P. Corporation, 31 Mts., Rs. 13,37,482; Sunil Enterprises, 15.500 Mts., Rs. 3,75,000; Vikram Plastics, 15.500 Mts., Rs. 3,75,272; Wimco Pen Co., 77.500 Mts., Rs. 18,76,410.

POLYSTYRENE: From Japan: Jayantilal Mangaldas & Sons, 51 Mts., Rs. 11,35,524; From Korea: Gadia Chemoplast P. Ltd., 51 Mts., Rs. 11,54,556; Ganesh Narayan & Sons, 34 Mts., Rs. 7,69,704; Jayantilal Mangaldas & Sons, 17 Mts., Rs. 3,78,526; Nutherm Insulations P. Ltd., 12 Mts., Rs. 4,17,596; Overseas Trading Corpn., 17 Mts., Rs. 3,79,220; 17,000 Kgs., Rs. 4,17,089; Plasto Metachem I.P. Ltd., 68 Mts., Rs. 16,45,544; R.K. Exports, 17 Mts., Rs. 3,52,914; Royal Trading Co., 102 Mts., Rs. 19,49,764; The Supreme Inds. Ltd., 136 Mts., Rs. 30,36,802; Ushpin Marketing P. Ltd., 17 Mts., Rs. 3,77,956; Xpro India, 102 Mts., Rs. 25,04,303; From Singapore: Sureka Insulation & Packagings, 11 Mts., Rs. 3,70,499; From USA: Plasma Coats P. Ltd., 34 Mts., Rs. 9,12,438.

PVC RESIN: From Brazil: Avon Inds., 27 Mts., Rs. 4,57,703; Bhagirith Pipe Inds., 61 Mts., Rs. 10,13,680; Billion Plastics P. Ltd., 50 Mts., Rs. 8,29,680; Chemoplast, 25 Mts., Rs. 4,15,016; Chetna Polycoates P. Ltd., 60 Mts., Rs. 10,16,164; Dynaflex Inds., 25 Mts., Rs. 4,23,271; Finolex Pipes Ltd., 400 Mts., Rs. 65,05,137; PCL Enterprises Ltd., 75 Mts., Rs. 12,44,828; Rigidor Plastics P. Ltd., 32 Mts., Rs. 5,31,559; Shri Ramakrishna Harihar Intl., 25 Mts., Rs. 4,15,314; The Supreme Inds. Ltd., 9 Mts., Rs. 1,49,290; 9 Mts., Rs. 1,51,865; 82 Mts., Rs. 13,83,659; 150 Mts., Rs. 25,31,088; Trimurti Foods & Pharmls., 75 Mts., Rs. 12,67,454; From Korea: API Polymers (India) Ltd., 36 Mts., Rs. 9,75,390; Bhor Industries Ltd., 128 Mts., Rs. 22,02,164; Dimple Overseas Ltd., 8.5 Mts., Rs. 1,46,267; 68 Mts., Rs. 11,70,140; 119 Mts., Rs. 20,47,738; 144 Mts., Rs. 24,86,547; From Mexico: Aman Rex P. Ltd., 25 Mts., Rs. 6,58,070; Anil Plastic Inds., 52 Mts., Rs. 8,79,872; From Mexico: Calcutta Chemical Agencies, 52 Mts., Rs. 8,80,623; Hitesh Plastics P. Ltd., 49.950 Mts., Rs. 8,61,743; Nikhil Udyog, 50 Mts., Rs. 13,16,063; Patram Inds. 52 Mts., Rs. 8,79,520; Premier Vinyl Flooring Ltd., 25 Mts., Rs. 6,31,075; From USA: Amar Plastics, 34 Mts., Rs. 5,83,132; Hind Exim, 17.500 Mts., Rs. 2,81,463; Jayantilal Mangaldas & Sons, 227.5 Mts., Rs. 36,19,154; Khatri Pipes P. Ltd., 50 Mts., Rs. 8,19,949; Movilex Plastics Ltd., 152 Mts., Rs. 24,87,630; M.S. Impex P. Ltd., 17.500 Mts., Rs. 2,81,654; Northern India Leather Cloth Mfg., 39.917 Mts., Rs. 11,19,625; Raka Plastics P. Ltd., 50 Mts., Rs. 8,19,779; Sanghi Leathers P. Ltd., 52.5 Mts., Rs. 9,08,762; Self Shine Industries, 17 Mts., Rs. 2,91,566; Vat Vinyl Inds., 52.500 Mts., Rs. 8,45,109; From Yugoslavia: Addis Corpn., 20 Mts., Rs. 3,29,260; Dimple Overseas Ltd., 250 Mts., Rs. 41,03,065; Hind Polymers, 45 Mts., Rs. 7,37,965.

SYNTHETIC RESIN: From USA: Indian Aluminium Co. Limited, 8,165 Kgs., Rs. 8,00,377.

MATERIALS IMPORTED BOMBAY (11.5.92)

ACTIVATED CARBON: From Netherlands: Hindustan Platinum Ltd., 2,880 Kgs., Rs. 3,49,990.

AROMATIC CHEMICALS: From Germany: Hindustan Lever Ltd., 600 Kgs., Rs. 4,28,773.

BISPHENOL A: From Japan: Intec Polymers (P) Ltd., 10,000 Kgs., Rs. 3,33,491.

CARBAMATE: From USA: Rhone-Poulenc Agro Chem I Ltd., 40,000 Kgs., Rs. 55,64,528.

CARNAUBA WAX: From Brazil: Shri Amarsinhji Stnry. Inds. Ltd., 15,000 Kgs., Rs. 8,19,552.

CITRIC ACID MONOHYDRATE: From Hong Kong: Delux Sales Corp., 20 Mts., Rs. 5,61,978.

DL 2 AMINO BUTANOL: From Germany: Cadila Laboratories Ltd., 15,210 Kgs., Rs. 42,41,365.

ETHOXYLATED NONYL PHENOL: From Germany: Hico Products Ltd., 33,600 Kgs., Rs. 10,03,671.

ETHYL DIGLYCOL (TECH): From Germany: Jaysynth Dyechem Ltd., 2,884 Kgs., Rs. 1,35,740.

ETHYL GLYCOL: From Germany: R.K. Chemicals, 15,288 Kgs., Rs. 4,55,657.

2 ETHYL HEXANOIC ACID: From Germany: Speciality Chemicals, 7,215 Kgs., Rs. 2,46,258.

GUM BENZOIN: From Singapore: Laxmi Traders, 3,972 Kgs., Rs. 30,088.

GUM COPAL BLACK: From Indonesia: Shamlal & Sons, 4,866 Kgs., Rs. 36,889.

GUM COPAL PWS: From Indonesia: Shamlal & Sons, 4,866 Kgs., Rs. 42,026.

ISOCYANATE: From Germa[ny]: Kaygee Foam Ltd., 2,000 Kgs., [Rs.] 2,27,670; From Germany: Milton P[las]tics, 8,250 Kgs., Rs. 4,39,195.

MYRCENE: From USA: Hindus[tan] Lever Ltd., 490 Kgs., Rs. 50,579.

NAPHTHALENE CRUDE: Fr[om] Denmark: Amal Rasayan Ltd., 1,64,7[..] Kgs., Rs. 20,66,260.

N-PROPANOL (ALCOH[OL] PROPYL): From USA: Bharat Jy[..] 13,089 Kgs., Rs. 4,57,292.

ORGANIC SURFACE ACTI[VE] AGENT: From USA: Century En[..] Ltd., 2,460 Kgs., Rs. 4,12,078.

ORTHO CHLOROTOLUEN[E]: From Italy: Shilpa International, 17,6[..] Kgs., Rs. 6,09,172.

POLYETHYLENE GLYCOL: Fro[m] Germany: Sandvik Asia Ltd., 1,0[..] Kgs., Rs. 63,455.

POLYVINYL ALCOHOL: Fro[m] Taiwan: Tirupati International, 17,0[..] Kgs., Rs. 8,09,905.

PROPARGYL ALCOHOL: Fro[m] USA: Artex Sunfin Chemicals Pvt. Ltd[.], 185 Kgs., Rs. 50,067.

SILICON DIOXIDE: From UK: Hindustan Lever Ltd., 30,000 Kgs[.], Rs. 18,71,592; Mul Health Care Pro[-] ducts P. Ltd., 15 Mts., Rs. 9,35,796[;] Universal Health Products P. Ltd[.], 15,000 Kgs., Rs. 9,39,888.

TERTIARY DODECYL MER[-] CAPTAN: From Germany: Apcote[x] Lattices Ltd., 2,145 Kgs., Rs. 2,24,791.

THIOUREA: From Japan: Cip[la] Ltd., 3,000 Kgs., Rs. 1,81,038.

TOLUENE DI ISOCYANATE: From Singapore: Kaso Chemie Ind[.] Ltd., 9 Mts., Rs. 6,00,283; Raj Leath[er] Cloth Inds. Ltd., 19,000 K[gs.,] Rs. 12,67,264.

TRIMETHYL ORTHO VALE[-] RATE: From Germany: Avik Pharm[a]ceuticals Pvt. Ltd., 125 Kgs[.], Rs. 7,23,393.